# 73 Amateur Radio Today

AUGUST 1993
ISSUE #395
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A WGI Publication
International Edition

## A DECADE OF PACKET

PcPakratt For Windows
File TNC Parameters Configure Tools Window Help
TNC1:PK900
PACTOR
Name here is Fred, using DSP-2232, have port 2 connected to local DX packet net.
Sure makes life easy, not having to switch back and forth!
I know what you mean, Fred. I've got two controllers going at once!
TNC1: Port 2
VHF Packet
1200
TNC2:PK232
BAUDOT
45
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYR CQ CQ CQ CQ CQ DE KF7GH
CQ CQ CQ CQ CQ CQ DE KF7GH KF7GH KF7GH GA
Model PK 900
POWER

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***73* Reviews the New AEA PK-9**
**and PC Pakratt for Windows**

08
1
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CIRCLE 112 ON READER SERVICE CARD

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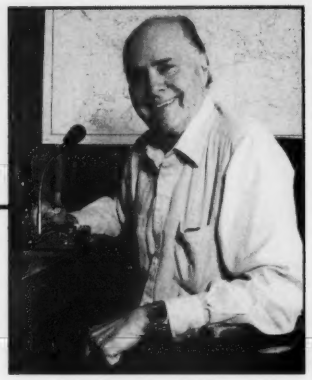
# NEVER SAY DIE

*Wayne Green W2NSD/1*



**The Ugly Americans**

No, we don't have a complete lock on being ugly, but we sure are way out ahead of whoever is in second place. Our recent and successful effort to chase His Majesty King Hussein JY1, the most famous ham in the world, off our bands with catcalls and name-calling is one of which all Americans can be proud. We can also point with pride to our continuing stupidity on 14.313.

One does not have to visit very many countries to find out what kind of reputation Americans have. The lack of consideration we exhibit in chasing DX is something they see in most American tourists, too. They claim we make up in arrogance what we lack in education and culture.

We tend to come across as unintelligent, but it isn't that. I'm convinced it's our educational system. Indeed, if you've taken the time to find out about IQ and IQ tests you know that (a) Asians have a several-point lead on whites in IQ, and that (b) American blacks tend to have a 15-point lag. You also know that (c) few journalists have bothered to learn the well-documented facts before writing on this emotionally-charged subject.

Alas, there's far too little correlation between having brains and using them. A computer is pretty useless when some of the keys are out of action and the programs have too little data with which to work. Well, the same goes for our brains. If we load them down with garbage, it's the old computer cliché: garbage in = garbage out.

So here we are with an educational system dumping garbage into little minds. We make up for that by virtually cutting off all intelligent communication with our kids, trusting them to learn how to interact with people via what they're watching on TV. Perhaps we deserve what we get.

No, I don't agree with King Hussein's support of Saddam. But I understand the fix he's in, with a large part of his people being Palestinians and being sucked in by Saddam's propaganda . . . plus a bunch of wishful thinking. I doubt any of us would have done as well as His Majesty under the circumstances. He's treading a tightrope over a tinder box, to coin a combo-cliché.

Of course, I'm critical of HM's getting into this fix. I think he could have avoided it. He's in trouble for the same reason we are . . . he's allowed a really terrible educational system to develop. I know you're going to find this difficult to believe, but Jordanian kids are even stupider than American kids, and it's got nothing to do with their basic intelligence. Our kids come out next to the worst in surveys. Only the Jordanian kids have managed to beat us out of last place in international comparison tests.

His Majesty has done a lot of good things for Jordan. But he's been so involved with Mideast politics that he's let some very important things slip through the cracks. In addition to re-inventing the Jordanian educational system, he also needs to put some effort into eliminating graft as a means of getting rich and put more emphasis on rewarding people who are working hard to improve the business climate.

He had a wonderful opportunity to provide leadership and help to the Palestinians in Israel by providing educational programs in Arabic on his TV stations and beaming 'em into nearby Israel. During the Intefada the Israelis closed the Palestinian schools. This seemed like a really dumb approach. It's ignorance that's the main enemy in that part of the world. About the only benefit to ignorance anywhere is the ability it provides to those with an education to take advantage of the ignorant.

Jordan has no natural resources of value, only its people. Thus, the more His Majesty invests in his people's education, the richer his country will be, and the better the legacy he will leave.

Several years ago I tried to convince HM of this, pointing out the potential Jordan had to become the educational center for the whole Arab world. Once they started broadcasting educational programs on TV they could also package them on videotape and easily repay the production costs. What courses? I had in mind everything from preschool on through to Ph.D. graduate courses. I had in mind courses helping people to learn special skills. Engineering, architecture, business, ecology, nutrition, astronomy, medicine, and so on. No, many of these won't eliminate the need for a live teacher, but they would make it possible for live teachers to reach a much wider range of pupils.

This approach to teaching will even work well with cooperative learning, where students work in teams and teachers are cheerleaders instead of instructors. This is a relatively new approach to teaching which is winning converts all around the world. I cover this in my book (*Declare War*), so I won't go into detail here on how it works.

**What Can We Do?**

The first step is to throw some light on the jerks who are devoting their lives to ruining our hobby. This means we need to get good at locating these ham terrorists. The FCC has some very sophisticated direction finding equipment these days, so I'd love to see some articles on how we can build what it takes to find these jerks.

I've already explained in the past how we can identify any individual transmitter just by its characteristics. Every rig has a slightly different fingerprint. All you do is record it and expand the starting edge of a transmission and you'll see that no two are precisely the same. We need some articles on this technology. As far as I know this stuff isn't classified, so let's see some articles.

Once we find out who these jerks are we can throw the spotlight on them and watch them scurry for cover, like the stinking roaches they are.

What better activity for a radio club than helping to clean up our hobby? We're supposed to be self-policing, so let's get our act together and deliver on our promise and stop calling the FCC and whining every time we have problems.

We can clean out 14.313 in short order if we really want to. And ditto any other festering sores that boil up.

**If You Hear HM . . .**

Tell him Wayne will be glad to come over and help get his educational system out of the cellar. I haven't visited Jordan in years, so it's about time I wandered over that way. Jordan is ideally located to help eventually solve the Israeli-Arab mess, as well as to stop the move to Muslim fundamentalism which is even a greater danger in the long run. All of these problems can be solved with education. But then, that holds for all the rest of the world's problems, too. Including ours.

There's no other investment that pays off nearly as well as one in education.

**Is It Time To Change?**

A letter from Brent Putnam N8UBD asking about combining the Novice and Tech licenses got me to thinking . . . always a bad sign. Now I know you are perfectly happy with the Novice, two kinds of Tech, the General, Advanced, and Extra Classes of license. And I know you really hate change. So what I'm going to discuss you're probably going to hate. Worse, I'm going to ask you to actually . . . gasp . . . think! Yes, I'm being sarcastic, thereby offending the half of you who actually do enjoy thinking, and at the same time offending the other half who find the whole concept of thinking alien.

I like to tackle problems by going back to basics and forgetting whatever Byzantine things have evolved so far. In the case of our amateur licenses let's first think about what the purpose is of having licenses. Do we need 'em?

I remember when I posed this question to the FCC about CB licenses. It had never occurred to them not to license CBers, so they were spending millions doing it. I asked them why. They didn't have any good answers other than they'd always licensed transmitters. And maybe the fact that there was a license would tend to make CBers obey the rules. Har-de-har. It took awhile for my reasoning to break through the bureaucratic minds, but eventually they gave up on issuing CB licenses. The sky did not fall. Sagged a little maybe.

Okay, what purpose does a ham license serve in 1993? Well, let's start with the exam . . . what purpose does it serve? Perhaps we can start by asking what do we really need to know to operate? I'd go back one more step in the obvious questioning and ask what is the purpose of the Amateur Radio "Service" in 1993, except that the answer would just tend to embarrass us and might, if the concept ever penetrated the government, lead to some unpleasant consequences.

Let's pretend that we're still able to fulfill some of our original responsibilities. Let's pretend that we are still paying our way in exchange for billions of dollars in precious frequencies. It's been a generation since we invented or pioneered any new modes, so we can scratch that one. The military hasn't called on us in time of war for 50 years, so we can scratch that one. International friendships? Nope, scratch that one too. We have few friends. We're Ugly Americans on the air. Okay, we are still around in emergencies, so that's something. Of course our traffic nets are hardly beyond smoke-signal speeds when it comes to throughput in this day of 9600 baud.

The technical part of our exam is geared to the days when we built and serviced our own equipment. These days we haven't a clue as to what is inside, much less have the test equipment and experience to try and fix it. What real purpose does the technical exam play these days?

Old-timers will remember back to 1963 when the ARRL proposed what was amusingly called Incentive Licensing. This was a proposal that everyone have to retake a technical exam before they could continue to operate on phone on any bands between 160m and 10m. This scared the living hell out of everyone. Take the exam again? No way! Tens of thousands of hams put their ham gear up for sale for anything they could get for it. This killed the market for new equipment so totally that ham industry sales dropped by 85% in 1964. This, in turn, forced 85% of the ham dealers out of business, as well as virtually all of the manufacturers. Within a couple years we'd lost over 700 ham stores, plus Hallicrafters, Hammarlund, National Radio, Millen, EF Johnson, Barker & Williamson, Central Electronics, Gonset, Sideband Engineers, Multi-Elmac, Harvey-Wells, Lakeshore Industries, Thordarsoon, Stancor, Eldico, and so on. Collins hung in there, but stopped all further product development, and

*Continued on page 84*

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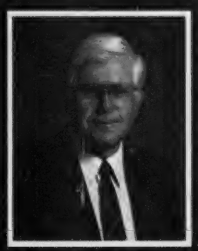

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# LETTERS

Number 2 on your Feedback card

## From The Hamshack

**Ted Brattstrom NH6YK, Honolulu HI** Wayne, in your eternal challenge to get hams off their rear ends and doing something new, I figured that I'd let you know what I've been up to in the two years since I received my license:

"Contacted" 106 DXCC countries on 10 meters (60 confirmed).

Had great conversations with a number of people, some of which I have even spoken to more than once!

Spent a lot of time playing with 10 meter SSB.

Had *chats* with U5MIR, U6MIR, and KB5SIW, using an HT and either a 5/8 whip on the car or a three-element hand-held beam. (Hawaii and Midway are great for this—there are few hams and not many of them are into satellites.)

Used the U5MIR-1 BBS to send messages to people and vice versa.

Set up and run TCP/IP on packet.

Demonstrated amateur radio to two educational technology conferences.

Helped six of my students get their ham licenses (mixed success here—I left that school and few of them have used their privileges).

Operated as NH6YK/ZL on 2m and 70cm in New Zealand. They have a brilliant rule there that states: If you are a legal amateur and authorized at home on VHF and have your license with you, you may operate 2 meters and above for up to four weeks without filling out a form! Merely use your call and append portable ZL. Wouldn't it be great if we had that rule?

Operated NH6YK/KH4 when I spent seven weeks on Midway atoll last summer. Although I operated only 10 meters and 6 meters (a couple of CW contacts each on 15, 40, 80), I made over 800 contacts. Except on 6 meters, a contact usually lasted long enough to tell people a little about the island and what I was doing there. I was a volunteer for the Fish and Wildlife Service, playing with gooney birds.

Learned (and am learning) about 6 meters. From Hawaii it is ALL DX, and fascinating. I had a borrowed 6 meter radio and antenna on Midway and contacted five "countries." That was fascinating. On Midway I used 100 watts; here at home I use only 2 watts, either into a dipole (at home) or a borrowed four-element quad (at school). Amazingly, I've worked VK4, VK7, FK8, T30, V73, JR6, VR6 and KH6 with that power. One time I used my 10m half-square antenna as the 6m antenna. It worked! One nice thing about 6 is that people are very willing to help the neophyte.

Went on a Kalawao County DXpedition. A small troupe of us flew over and set up for the weekend. Since there are no active hams in the county, a former/current Hansen's disease colony, this was a relatively sought-after contact by some. I got to make my first AO-13 contacts there. That was a lot of fun, and brought back the days I was station manager/operator for PEACESAT in American Samoa and using ATS-3.

I'm just starting to play with AO-21. I've now managed to pick up the digital recording, and I'm going to have to plug the TNC back into the computer and see if I can decode the packet! I'll try again tonight to make a voice contact on it with the 70cm up/2m down.

What's on the frontier for me: upgrade—get the code out of the way and gain access to those other frequencies; get more of my students licensed and operating; work on some radio astronomy; find some money or scrounge an ATV system; likewise, satellites.

I'll be operating in V31 and TI this summer, probably just 6m and 2m FM, unless I can convince the YL (also licensed) that a small 10m rig is reasonable amongst the cameras and scuba gear, and hopefully the E6B and charts so I can do a little flying also.

So, I try to keep up on the radio side of things. Oh, my real work is as a chemistry teacher at Pearl City High School.

Wayne, keep it up. If nothing more, you get people stirred up enough to do *something*. *Radio Fun* and *73* are great.

**J. A. Fontana VE3MJF, Ottawa, Canada** I'm a recently licensed ham (18 months) and have been alternately buying *73* and the "other" magazine off the rack, trying to make up my mind. This month I decided on and subscribed to *73*. I think, overall, that it has more that the "little guy" can relate to and it is not as esoteric as the other one.

I enjoy your editorials. I'd like to see a monthly "For the Sake of Argument" column in which you invite your readers to comment on something about the sport that troubles them, or needs fixin', or whatever. Something stimulating.

*Good idea! . . . Wayne*

**Guy DeMarco N2LWL, San Diego CA** I voraciously read your magazine from cover to cover. You seem to be able to print some of the most buildable (and usable) projects. Your department columns are top-notch.

But . . . (I'm sure you saw this coming!) I do have a gripe. I am an Avionics Technician in the Navy. I'm a bit put off by Wayne's moaning that us enlisted-type electronics specialists are "not what we used to be." I am finishing up my engineering degree in electronics and am an avid ham and teacher of electronics. While there are bad technicians who cannot read a schematic, please don't classify those of us who are proud of our accomplishments with the complacent service members. There's always *one* bad presidential candidate. *One* does not prejudice all.

Yes, I'm a club officer, an Elmer, a teacher and a happy and challenged ham. Yes, I'm a college student and a defender of our constitution. Therefore, please do not toss out anecdotes about how awful the Navy technicians are. I'm sure didn't mean to stereotype us, but I'd be reassured if you could keep this in mind.

**Tom Bowes KB8NDS, Richmond MI** Wayne, I wanted to write to tell you how much I have been enjoying *73 Magazine* and the ham radio hobby I discovered about a year and a half ago. I look forward to picking up a copy of *73* each month and, of course, the first thing I turn to is your column. I find that I agree with you most of the time (pretty scary), and it is partly because of your input that I have continued to expand my knowledge by getting into computers and packet radio. The only thing I can't figure out is why your remarks seem to cause such a violent, knee-jerk reaction in some people. It is as if they were indignant that anyone should awaken them from the stupor of snoozing in front of the TV.

I caught your presentation at Dayton and found it thoroughly enlightening and thought-provoking. I agree with you wholeheartedly about our alleged emergency service role and its overall lack of efficiency. I participated in my first RACES exercise last fall and was immediately convinced that there had to be a better way. One month later I bought a TNC, a $10 dumb terminal and a secondhand 2 meter rig and voilà, I became a packeteer. Now all I have to do is convince our local RACES group to really get serious about developing an effective packet network. You have mentioned the ridiculous nature of the CW traffic-handling nets. I'll add to that by mentioning the ridiculous nature of the phone-traffic-handling nets. All this "Would you please repeat, I didn't get the right count" and "Sorry, I couldn't copy you because somebody doubled" stuff has got to go. It's no wonder most amateurs aren't involved in emergency communications. The speed of most NTS and emergency phone nets reminds me of when I was a kid playing my 78 rpm records on the 33 speed. Things just go soooooo . . . slooooow. I couldn't take enough No-Doz to deal with the pace of most nets.

While at Dayton I spent some time lobbying the major radio manufacturers with my idea of how they could improve their products and help out the amateur radio operator's emergency service role. What I am proposing is that they incorporate into the design of every radio a separate packet port on the rear of the radio. This port would be configured with the same pin configuration for every radio manufacturer, and eventually for every TNC. The radio would also be programmable to allow disabling of the microphone and speaker audio during digital operation. It would also allow the packet port to be disabled when on a phone frequency preset. This feature would help to eliminate the problem of those who forget to turn off their TNC when changing frequency and consequently end up transmitting packet tones on a phone frequency and consequently end up transmitting packet tones on a phone frequency. It would also allow one to work packet without having to find a way to eliminate the annoying "brap-brap" of the rig's speaker.

My reason for proposing a standardized port configuration is that I have heard of too many instances where an emergency packet station has been rendered inoperative because the radio failed. While there were other radios available for use, none could be used because of the lack of a proper interface cable. By having all rigs configured the same way we could increase our flexibility in an emergency situation. My proposed data port configuration would be the venerable 9- (or 15-) pin female D-sub connection. Think of it—the cables would be inexpensive (about three bucks), widely available, and by the virtue of the thumbscrews on the cable hood they couldn't pull out of the back of the rig as my DIN connector is so fond of doing. Now, I realize that all this practicality would likely cost our beloved radio manufacturers some revenue due to the lost sales of adapters and specialty connectors, but I am convinced that they could probably come up with some other scheme to get our hard-earned dollars.

In addition, all of these radios would be set up for 9600 baud operation right out of the box, without the additional hassle of modifications. I would also like dual-band rigs to come with the ability to run packet via the data port on one band, while being able to simultaneously accommodate phone operation on the other band via the microphone jack and internal speaker. Or . . . the dual-band rig would be able to run packet on both bands at the same time and would be interactive with the TNC, via one of the data connector's pins, to allow remote operation of a digital crossband mode while using only one TNC. There would also be a +13.8 volt terminal built into the connector in order to eliminate the need for a separate power supply for the TNC. Although it may sound like I have my head in the clouds with this radio design wish list, there is really no reason why all of these features could not be incorporated into a rig with the technology that is now available.

The reason that I am writing to you, Wayne, is to enlist your support for these design goals for our radio gear. It is my hope that by incorporating these improvements into our radios, more operators will be encouraged to get into digital modes. Hopefully, with some publicity, and amateur operator support, we will soon see a new generation of rigs which are truly plug-and-play with respect to the up-and-coming digital modes.

*Great idea! . . . Wayne*

## Low Cost GaAsFET PREAMPS

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### LNS-(*) IN-LINE PREAMP

***ONLY* $89 kit, $119 wired&tested**

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

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- GaAs FET preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-( * ), *$80 vhf, $110 uhf.*** **Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

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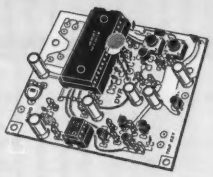
Low noise converters to receive vhf and uhf bands on a 10M receiver.
- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**
- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).

## TRANSMITTING CONVERTERS

**XV2 for vhf and XV4 for uhf.** Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

## ACCESSORIES



NEW DVR-1 DIGITAL VOICE RECORDER Module. Primarily a **voice ID'er for repeaters**. May also be used as a **contest CQ caller** or as a **"radio notepad"** to record up to 20 seconds of received transmissions for instant recall. As a **repeater ID'er,** it will record your voice, using either the built-in microphone or an external mic. It can be used with almost any repeater COR module. As a **contest caller,** you can record a message or even several messages and play them through your transmitter at the press of a switch. As a **radio notepad,** you can keep it wired to the audio output of a receiver ready to record up to 20 seconds of anything you might want to recall later. Play it back as many times as you like through a small external speaker. (Call for more information.) .....kit $89, w&t $139

TD-3 SUBAUDIBLE TONE DECODER/ ENCODER. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions ....kit $29, wired & tested $69

COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier ..... kit $49

CWID. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... kit $59

COR-4. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call ..... kit $99, w&t $159

TD-2 TOUCH-TONE DECODER/CONTROLLER. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired & tested $149

NEW TD-4 SELECTIVE CALLING Module. Economy touch-tone decoder with 1 latching output. Primarily designed to mute speaker until someone calls you by sending 4-digit tt signal but may also be used to turn on autopatch or other device..... kit $49, w&t $89

AP-3 AUTOPATCH. Use with above for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver ..... kit $39

MO-202 FSK DATA MODULATOR. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. ..... kit $49, w&t $79

DE-202 FSK DEMODULATOR. For receive end of link. ..... kit $49, w&t $79

9600 BAUD DIGITAL RF LINKS. **Low-cost** packet networking system, consisting of MO-96 Modem and special versions of our 144, 220 or 450 MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

NEW **Real-Speech Voice ID Option Available With DVR-1 Digital Voice Recorder Shown At Left!**

# REP-200 REPEATER

**A microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!**

**We don't skimp on rf modules, either! Check the features on R144 Receiver below, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.**

***Kit $1095; w&t only $1295!***
*Voice ID Option $189.*

### Other models available:

**REP-200V Economy Repeater.** As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

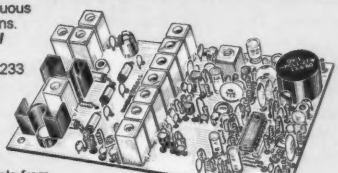
**REP-200N Repeater with no controller.** For use with external controller, such as those made by ACC. **Kit only $695, w&t $995.**

- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- *FCC type accepted for commercial service (hi-band and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 20W 50-54MHz; 15W (25W option avail.) 143-174MHz; 15W 213-233 MHz; 10W uhf; 10W 902-928MHz.
- Available add-on PA's **up to 100W.**
- **Six courtesy beep types,** including two pleasant multi-tone bursts.
- **Open or closed access autopatch, toll-call restrict,** auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- Pulse (rotary) dial option available.
- **DTMF CONTROL:** over 45 functions can be controlled by dtmf command. 4-digit control code for each function.
- **Owner can inhibit** autopatch or repeater, enable either open or closed access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options.
- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters.**
- Many **built-in diagnostic** and testing functions using microprocessor.
- Color coded **LED's indicate status** of all major functions.
- **Welded rf-tight partitions** for exciter, pa, receiver, and controller.
- 3½ inch aluminum rack panel, finished in eggshell white and black.

## XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

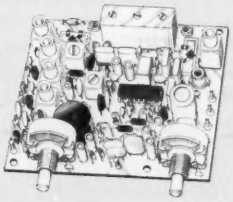
**Also available in rf-tight enclosures, and with data modems.**

**FM EXCITERS:** 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l hi band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
- **TA901**: 902-928 MHz, (0.5W out); w&t $219.
- **VHF & UHF AMPLIFIERS.**
- For fm, ssb, atv. Output levels from 10W to 100W. Several models starting at $99.

**FM RECEIVERS:**



- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift. ...kit $149, w&t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w&t $219.
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion, GaAs FET front end. ...$169, w&t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w&t $219.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w&t $219.

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# QRX . . .



## Uh-Oh, Canada!

Earlier this year, a major snafu in our distribution system caused all Canadian subscription copies of *73 Amateur Radio Today* to be held up in a warehouse somewhere (presumably) close to the Arctic Circle. By the time we got a sled team together to retrieve the magazines, Canadian subscribers had missed a couple of issues. By now, all Canadian subscribers should have received all of the missing issues.

As a way of making amends to our ham radio brethren (and sisteren) north of the border, all Canadian subscribers active on March 1, 1993, will have two free issues added to the term of their subscription. We know that this in no way makes up for the trauma of not receiving your regular dose of *73 Amateur Radio Today*, but we hope you'll forgive us anyway.

## New Repeater Packet Rules Proposed

The FCC has taken a long-awaited step towards establishing new policy for ham stations involved in automatic message forwarding. The commission has adopted its Notice of Proposed Rulemaking—a measure which foreshadows new regulations which will hold repeater control operators harmless for any prohibited communications instantly retransmitted through the repeater.

Under the new rules, only the originators of instantly-retransmitted communications are to be held accountable for content violations flowing through a repeater. But when it comes to packet, the FCC wants to hold both the originating and first forwarding station licensees responsible for prohibited communications. The idea is that a packet message could be reviewed, but repeater traffic is instantaneous.

Under the rules currently in effect, each amateur station is fully responsible for assuring that the contents of every transmission from his or her station complies with the rules. Generally speaking, this was never a problem for hams until the advent of high-volume, high-speed digital message forwarding systems. *TNX W5YI Report, Vol. 15, April 15 1993.*

## Details Released on 219-220 MHz Access

The FCC has fleshed out its Notice of Proposed Rulemaking to " . . . provide a secondary allocation for the Amateur Service in the 219 to 220 MHz band to be used for amateur auxiliary station (point-to-point) packet backbone and other amateur point-to-point fixed communications." In response to a petition filed by the ARRL, the commission is proposing to allocate, on a secondary basis, the 219-220 MHz band for inner city wideband packet radio networks and other point-to-point fixed operations.

According to the commission, this will (a) relive the congestion in the 222-225 MHz band, (b) encourage the development and implementation of a packet network that can be used for emergency and national defense communications, (c) facilitate connection of local packet nodes to form such a regional or nationwide network, and (d) provide spectrum for exploration of new technology. *TNX W5YI Report, Vol. 15, April 15 1993.*

## ITU up to 176

Three new countries from the former U.S.S.R. have joined the International Telecommunication Union as members so far this year. They are Georgia, Slovakia, and Kazakhstan. The ITU now has 176 member nations. *TNX W5YI Report, Vol. 15, June 1 1993.*

## Special Club Callsigns Approved

The FCC has amended its Amateur Service rules to provide for volunteer organizations to administer a system designed to provide special callsigns to club and military recreation stations. This action was authorized by the Telecommunications Authorization Act of 1992. Organizations selected for the new system will be known as "Club and Military Recreation Station Call Sign Administrators."

To qualify, the club must exist for the purpose of furthering the Amateur Service, must be comprised of at least one percent of all hams licensed by the FCC, and must be capable of serving as administrator in all places where the Amateur Service is regulated by the FCC.

Each administrator will be assigned a block of two-by-three-letter callsigns. Dates for accepting administrator applications have not yet been announced. *TNX Westlink Report, No. 650, May 27, 1993.*

## Consolidating VE Programs

Novices will soon be folded into the same licensing examination process as everyone else, under an FCC measure adopted on May 3rd. Currently (at press time), there are two different examination programs in the Amateur Service. For years, Novices have been informally tested by two volunteers. The Technician through Amateur Extra Class candidates have been tested under the VEC system—using teams of three accredited Volunteer Examiners. The three are managed by a Volunteer Examiner Coordinator who acts as a liaison between the VEs and the FCC.

Apparently, the Commission likes the way that the VEC program is going, because the rate of errors has plummeted and the system is saving taxpayers an estimated $1 million each year. The Novice testing system has an estimated error rate of nearly 10 percent and data collection has also been a weak point. The commission also hopes to minimize fraud by consolidating the VE programs.

The new FCC rules take effect July 1, 1993, placing responsibility for the preparation and administration of the Novice Class operator license examinations under the VEC system. The commission also has decided to allow for recovery of out-of-pocket costs for coordinating and administering such examinations. *TNX W5YI Report, Vol. 15, June 1 1993.*

## Senator Extols Amateur Service

A Joint Resolution (S.J.90) has been introduced in the United States Senate recognizing the achievements of radio amateurs. Senator Charles Robb of Virginia drafted the bill, which calls for a national policy supporting amateur radio.

The resolution urges adoption of rules and regulations that encourage the use of new technologies within the Amateur Service. It also requests that any regulations which are necessary at any level of government be crafted in ways that encourage ham radio as a public benefit. *TNX Westlink Report, No. 650, May 27, 1993.*

## French Launch Orbiter

A new satellite has joined the amateur radio community. Sponsored by the French Radio Amateur Club de l'Espace (RACE), the ARSNE (UO-22) satellite was sent into orbit from an Ariane-4 rocket right on schedule on May 12 at 00:56 UTC. It was launched from the European Space Agency's spaceport in Kourou, French Guiana, on the northern coast of South America.

After all the minor bugs are worked out of the satellite, the ARSENE will be open to packet traffic from all radio amateurs worldwide. The orbiting digipeater is equipped with an uplink frequency of 435.100; downlink 2446.5 MHz. *TNX W5YI Report, Vol. 15, June 1, 1993.*

## TNX . . .

**. . . to all our contributors!** You can reach us by phone at (603) 924—0058, or by mail at *73 Magazine*, Route 202 North, Peterborough NH 03458. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 924—9343 (300—2400 bps), 8 data bits, no parity, one stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun*. You can also send news items by FAX at (603) 924—9327.

# INTRODUCING THE PK-900... NEW FROM THE INSIDE OUT!

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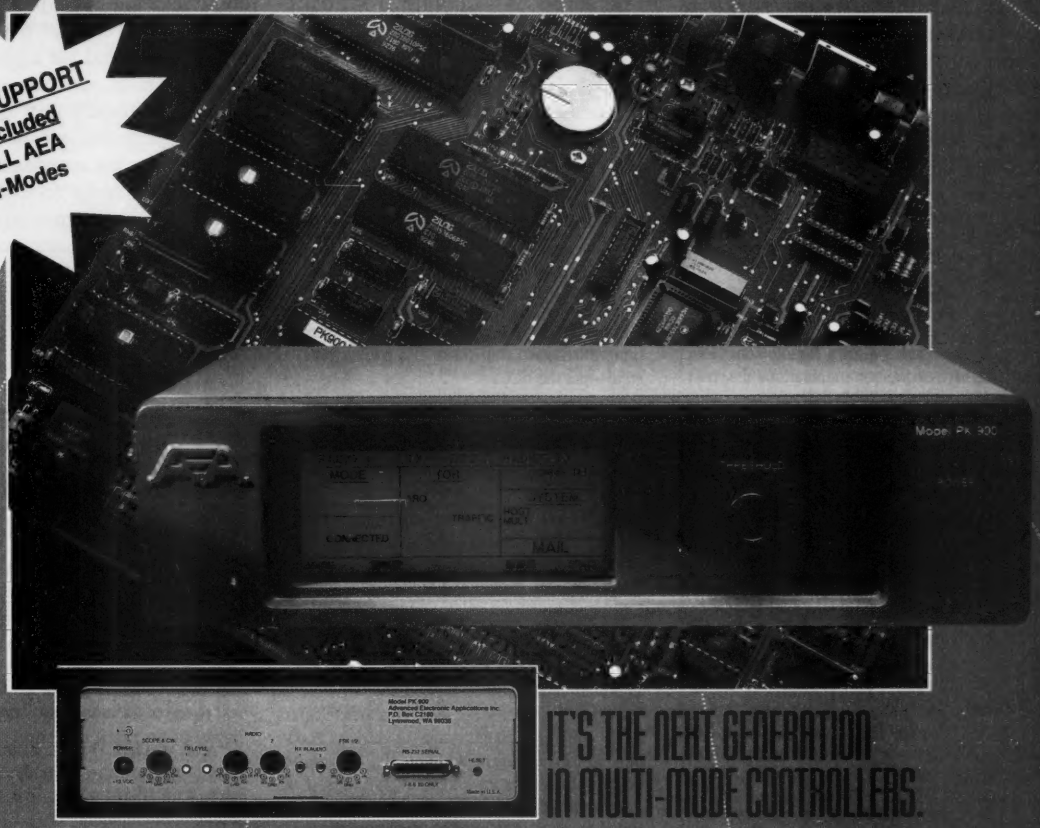





## IT'S THE NEXT GENERATION IN MULTI-MODE CONTROLLERS.

Now, there's a new standard of excellence in multi-mode digital controllers...the new PK-900 from AEA. It incorporates all of the features which made the PK-232 the most popular multi-mode controller in the industry. But that's just the start. AEA's new PK-900 also features dual port HF or VHF on either port; low cost 9600 baud plug-in option; memory ARQ and VHF DCD state machine circuit; powerful triple processor system; zero crossing detector for the sharpest Gray Scale FAX you've ever seen; and many other new software selectable features.

Inside and out, the new PK-900 from AEA is what other multi-mode controllers will now be measured against.

- Processors used: Zilog 64180, Motorola 68HC05C4, Motorola 68HC06B4
- Data rates: 45 to 1200 baud standard, up to 19.2K baud with external modems
- Dimensions: 11.75" (29.84cm) x 11.75" (29.84cm) x 3.5" (8.89cm) Weight: 4.6 lbs. (2.08 kg)
- Power requirements: 12 VDC at 1.1 amps

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# A Decade of Packet

## *An anthology of 73 packet radio articles from 1983 to 1993.*

by Charles Warrington WA1RZW

It may seem hard to believe, but the *new* technology we call packet radio has been gaining popularity with hams for some 10 years now! Regular readers of *73* know this magazine has given the subject intensive coverage. Not only will you find Jeff Sloman N1EWO's monthly column, "Packet & Computers," but you'll also find a compendium of construction articles, product reviews, and a few surprises—ranging from backpack units to space shuttle communicators.

If you've waited 10 years to get into packet, perhaps this little treatise is just the boot your system needs. Here you will find a handy-dandy index of *73* packet articles, and a brief abstract of each. We have also included separate listings of packet columns and packet product reviews. Now you can dig out whatever information you need for a painless packet primer. If, on the other hand, packet is already part of your ham radio repertoire, we hope you will find this to be a valuable resource which will help to enhance your knowledge and future enjoyment.

### Chronological Listing of *73* Packet Articles

**"Join the Packet-Radio Revolution.** Get error-free, high-speed communications. Packet radio's chief architect, WA7GXD, explains what it is and how it works." (by Lyle Johnson, Sept. 1983, p.19.) "This article is written to give the reader a practical look at packet radio, including a practical description of the equipment needed to use this new communications mode. . . . While the reading should prove interesting, the application of packet radio in *your* hamshack is the primary goal."

**"Join the Packet Radio Revolution, Part 2.** Warm up your soldering irons. This part offers the nuts and bolts of building your own TNC." (by Lyle Johnson WA7GX, Oct. 1983, p.20.) The author describes the Tucson Amateur Packet Radio (TAPR) Terminal Node Controller (TNC), and gives enough detail for the homebrew artist to build one.

**"Join the Packet Radio Revolution, Part 3.** Don't mess up. Packet protocols and procedures are all-important, says WA7GXD, and he's been right so far." (by Lyle Johnson, Jan. 1984, p.36.) In the final installment of his three-part series, WA7GXD illustrates the formal rules governing packet information transfer and tips for practical application.

**"GLB Update"** (QRX, March 1985, p.7.) "Packeteers using GLB TNCs, in particular those using them as digipeaters, should contact GLB for an update of their software." This short item includes where to send PROMs for update.

**"Packet Places"** (QRX, May 1985, p.8.) This short item presents a list of frequencies where you can find packet activity at various locations around the country.

**"TAPR Two-Tone"** (QRX, Sept. 1985, p.7.) This short item offers a commercially-made cabinet for the TAPR TNC-1 from Heathkit.

**"Packet Panic!"** (QRX, Nov. 1985, p.8.) This short article outlines packet radio's rapid growth and some recent software developments.

**"Packet Reprieve"** (QRX, May 1986, p.7.) Short news item explains that, for the present time, third-party traffic sent via packet radio is legal—per the FCC.

**"TNC Fix"** (QRX, May 1986, p.7.) Item contains a modification which can be performed on a TAPR TNC-2 or an AEA PK-80 to prevent interference.

**"A Packet Primer.** First you've got to know the lingo." (by Gwyn Reedy W1BL, Aug. 1986, p.28.) In this comprehensive article, the author discusses why packet is becoming so popular. He compares packet's advantages and disadvantages with those of its technological ancestors.

**"How to Make Friends at 1200 Baud.** W2JU's guide to AX.25 etiquette." (by Norm Sternberg, Aug. 1986, p.34.) "This article offers a few collected thoughts and suggestions about: bandwidth of transmitted signals, transmitter keying characteristics and time constants, TNC parameter values (especially timing), beacons, and channel courtesy and good manners."

**"Precision Packet Tuning.** Build the ultimate digital tuning indicator for packet or RTTY." (by John W. Langer WB2OSZ, Aug. 1986, p.40.) Includes the schematic, circuit board design, parts list, etc. for constructing this project.

**"So You Want To Be A Sysop?** It's not as easy as it looks." (by Jon Pearce W2MNF, Aug. 1986, p.50.) "This article describes some of the trials, tribulations, frustrations, and rewards of becoming a packet BBS sysop." The article is also useful reading for the user, and includes instructions for smooth system operation.

**"Birds 'N' Bauds.** Satellites are going digital in a big way—Five international experts combine to define our place in space." (by Harold Price NK6K, Tak Okamoto JA2PKI, Hanspeter Kuhlen D1YQ, Peter Guelzow B2OS, Donald Moe DJØHC/KE6MN, Aug. 1986, p.58.) This article discusses the frontiers of ham satellite technology and provides hints on how to take advantage of these advancements.

**"Connect Alarm!** Let your TNC call you when it has something to say." (by Louis I. Hutton K7YZZ, Aug. 1986, p.66.) A quickie construction project which, when attached to your TNC, sounds an alarm whenever there is a connect to your packet system.

**"Survival Training For Mountaintop Digipeaters.** A ROM with a view." (by George Flammer WB6RAL, Aug. 1986, p.68.) "This article describes a network of mountaintop digital repeaters covering the state of California." It includes network goals, trials and tribulations, and a look at the future.

**"Beyond Level Two.** High-level networking comes to packet radio." (by Phil Karn KA9Q, Aug. 1986, p.74.) "This article is for the user who is ready to take the advanced packet course. It discusses issues at the center of the next round of technical development."

**"And If That Wasn't Enough . . .** NK6K takes questions from the audience." (by Harold Price, Aug. 1986, p.80.) Five pages of packet questions and answers.

**"On The Shelf"** (by Harold Price NK6K, Aug. 1986, p.86.) An amateur packet bibliography. A good source for further reading.

**"Packet Lunacy"** (QRX, Oct. 1986, p.7.) In this short news item, W3IWI has successfully bounced packets off the moon.

**"G/ACK"** (QRX, Feb. 1987, p.7.) Short news item features a breakthrough for packet radio in Great Britain.

**"Packet RATS.** WA3DNM's Resume-After-Transmit Scanner lets your IC-27A do double duty." (by David C. Wolovitz, May 1987, p.30.) This construction article allows you to upgrade your IC-27A by connecting this home-brew Resume-After-Transmit Scanner to your digipeater.

**"The Digital Novice.** K9EI covers the basics and terminology of ham's digital world—from Samuel Morse's basement to packet proficiency." (by Jim Grubbs, June 1987, p.28.) The author presents options for the beginner who has

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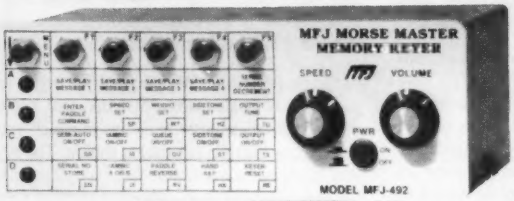


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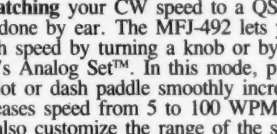

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★ **You** get 32,000 characters of memory.

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. . . **an** *FCC Exam Simulator* that sends random QSOs exactly like the FCC exams. When you can copy these random QSOs, you're ready to pass your exam and upgrade!

. . . **MFJ's** *QSO Simulator* makes learning Morse code really fun. It's like making real on-the-air contacts. You can answer a CQ or call a station and enjoy a nice a QSO. You'll get operating experience while boosting your code speed.

. . . **a** new *Word Recognition Mode* gives you hundreds of commonly used words in amateur radio for you to practice recognizing entire words instead of individual letters. With practice you can learn to copy words in your head without writing it down and carry on an entire CW conversation without paper -- just like the pros.

**Compact** 7½x2½x6¾ inches. Use 12 VDC or 110 VAC with MFJ-1312B, $12.95.

**MFJ-79,** $19.95, full function Remote Control.

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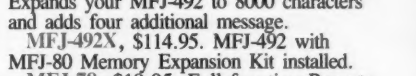

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not yet experienced any of ham's digital communication modes.

**"Big Time Packet.** K1TE can control a packet station from his desk or anywhere in the world—with a little help from his computer." (by Bradshaw B. Lupton, Jr., July 87, p.44.) The author describes how his passion for packet has made his workday lunch hour (and his correspondence) move along quickly.

**"The Year 2000—Packet Radio Then and Now.** The author predicts packet radio of the future—using today's technology." (by Bill Ashby K2TKN, Aug. 1987, p.24.) The author gazes into his crystal ball and attempts to describe the state of the art in the next millennium.

**"AI on Packet?"** (by William McMullan KE5L, Aug. 1987, p.29.) The author presents his "TRON" computer program, which will run your packet station automatically but does not actually use AI (artificial intelligence).

**"U.S. Packet Digipeaters/PBSs"** (by Don Bennett K4NGC, Aug. 1987, p.33.) A list of packet digipeaters and packet bulletin boards reported to be on packet radio in the United States.

**"IC-2AT Packet Interface.** Use WB5WSV's external PTT circuit to get on packet with an IC-2AT and an MFJ-1270." (by Wayne Eleazer, Aug. 1987, p.49.) This article shows you how to build a circuit which will allow the IC-2A to key up when connected to an MFJ-1270 TNC.

**"On the Road and On the Air.** Tales of a high-tech nomad." (by Steven K. Roberts KA8OVA, Feb. 1988, p.11.) The author developed a high-tech bicycle equipped with packet radio, among other things. He also discusses life on the road with his bike.

**"Emergency 'Pocket' Packet.** Instant packet in your jacket." (by David McLanahan WA1FHB, Apr. 1988, p.25.) A complete portable emergency packet station utilizing the ICOM 02-T, the GLB K1-L TNC, and the NEC 8201A laptop.

**"Bicycle-Mobile Packeteering.** It's time to pull packet radio out of its infancy!" (by Steven K. Roberts N4RVE, Apr. 1988, p.41.) The author picks up where he left off in his February article.

**"The Care and Feeding of a PBBS.** Timely tips for packet bulletin board users (Part 1)." (by David McLanahan WA1FHB, June 1988, p.23.) "One of the perks of working packet is being able to access one or more of the Packet Bulletin Board Systems springing up all over the country." The author teaches you how to take advantage of these PBBSs.

**"Care and Feeding of a PBBS.** Timely tips for packet bulletin board users (Part 2)." (by David McLanahan WA1FHB, July 1988, p.60.) The author continues where he left off in Part 1 with some final tips for packet BBS users.

**"Digicom>64.** A software-based packet radio system for the Commodore 64." (by Barry N. Kutner, M.D. W2UP, Aug. 1988, p.22.) A cheap 'n' easy packet radio system, including circuit descriptions and schematics.

**"Packets Full of Pixels.** Packet Scan Amateur Television." (by Robert G. Pratt WD8AQX, Oct. 1988, p.10.) The author has found a way to combine amateur radio, computers, and video into " . . . a fun-filled super hobby that results in very slow-scan television images sent across town or around the world via packet radio."

**"Ham Call Directory on Packet."** (QRX, Nov. 1988, p.9.) A short news item. A Virginia ham (no pun intended) has compiled a CD ROM database of US amateurs which is accessible by packet radio.

**"Scotland"** (QRX, Dec. 1988, p.9.) Tiny news item. "Packet digi-peating has come to Scotland."

**"Packet Tuning Indicator.** Dead-on HF packet tuning for $15." (by Ronald B. Koester W2EKY, Dec. 1988, p.24.) This easy and inexpensive construction project includes the schematic, circuit board design, and parts list.

**"TCM 3105 Modem for the Digicom>64.** A mini-modem for 1200 baud packet." (by Craig Rader N4PLK, John Krohn KJ4GP, Sam Baine W4KUM, and Mike Zinicola WD4PVS, Feb. 1989, p.42.) This project is a modem for the Digicom>64 TNC Emulator program that works exclusively on 10 meters, VHF, and UHF at 1200 baud. Circuit board design, parts placement diagram, and schematic are provided for this small and inexpensive home-brew.

**"Getting High on Packet. Excellent advice for getting on HF packet."** (by Brian Lloyd WB6RQN, Feb. 1989, p.50.) This "how to" article gets you started on HF packet including theory and practical operating suggestions.

**"The Net/ROM-NordLink Question.** A case of software piracy?" (by Neil Shapiro WB2KQI, June 1989, p.34.) A discussion of a legal battle over software rights which an American firm claims were violated by a German firm. The software in question was designed to enhance packet radio data transfer.

**"Packet Racket Lip Zipper**. Automatically turns off your rig's speaker during packet operation." (by Michael J. Geier KB1UM, Oct. 1989, p.13.) "The Lip Zipper switches the audio output of your rig from an external (or internal) speaker to the audio input of your TNC. In addition, you can use it to switch the rig's mike input between the mike and the TNC." Schematic and parts list are included.

**"Setting Up a Packet Radio Station.** An excellent guide for beginners and veterans alike." (by Brian Lloyd WB6RQN, Oct. 1989, p.14.) This is a step-by-step guide for the packet beginner which discusses equipment selection and how to configure the system.

**"My SX-64 Runs Digicom!** Low-cost packet solution for your portable C-64." (by Ted Drude KA9ELV, Oct. 1989, p.24.) "If you couldn't figure out how to get Digicom running on your SX-64 portable, you can get the complete story here, including how to modify Digicom modems to work with the SX-64, and how to make the proper internal connections."

**"Digital Dreams.** We have not yet begun to packet!" (by Bdale Garbee N3EUA, Oct. 1989, p.28.) This article describes ways in which you can "turbo-charge" your packet station. The author discusses a variety of frequency options, networks, and software advancements to help the packeteer reach his or her potential.

**"Let the TNC Work While Your PC Sleeps.** Give your older TNC personal mailbox capability—with no hardware changes!" (by David Bartholomew WB6WKB, Oct. 1989, p.30.) This brief article outlines a procedure by which you can "turn your packet answering machine on."

**"Put Your IC-22S on Packet. Dust it off and dedicate it to 2m packet!"** (by Michael S. Dooley KE4PC, Oct. 1989, p.31.) "Are you tired of tying up your synthesized radio on packet? If you have access to an ICOM IC-22S, a fast and easy fix will get it on this fascinating mode."

**"KAM Box.** Packet and WEFAX for the lazy." (by Joe Davidson N4AQG, Oct. 1989, p.32.) The author tells you how to modify the Kantronics UTU to allow you to take advantage of packet and weather fax modes. "These alterations have made a very nice operating interface just a little more friendly."

**"One-Chip RS-232 for the C-64.** Easy and inexpensive RS-232/TTL level interface." (by Mike Kabala KBØCDQ, Oct, 1989, p.34.) The author explains how you can build an interface to convert all the Commodore's signals from TL levels to levels that agree with the EIA standard. PC layout and parts list are included.

**"Packet Radio in Japan.** Bits of information on packet in the land of the Rising Sun." (by David Cowhig WA1LBP, Oct. 1989, p.38.) A news roundup of packet radio in a country the size of California with 1.6 million hams.

**"Standardizing the Radio/TNC Interface.** Patch any rig to any TNC or data controller in just a few moments!" (by Brian Lloyd WB6RQN, Oct. 1989, p.40.) The author describes the perfect interface (project) for that packet-rat ham who has collected five different radios and five different TNCs.

**"Packet Radio and High-Tech Nomadics**. A sneak preview of the Winnebiko 3." (by Steven K. Roberts N4RVE, Oct. 1989, p.48.) The author is the inventor of computerized, ham-radio-equipped bicycles which he has pedaled across the United States. This article examines his third generation bike, which is packet equipped.

**"Improve your TNC's DCD circuit.** Make your DCD faster and more discriminating." (by Eric Gustafson N7CL, Oct. 1989, p.50.) "The DCD circuitry for nearly all currently available TNCs are deficient for use on a radio channel.

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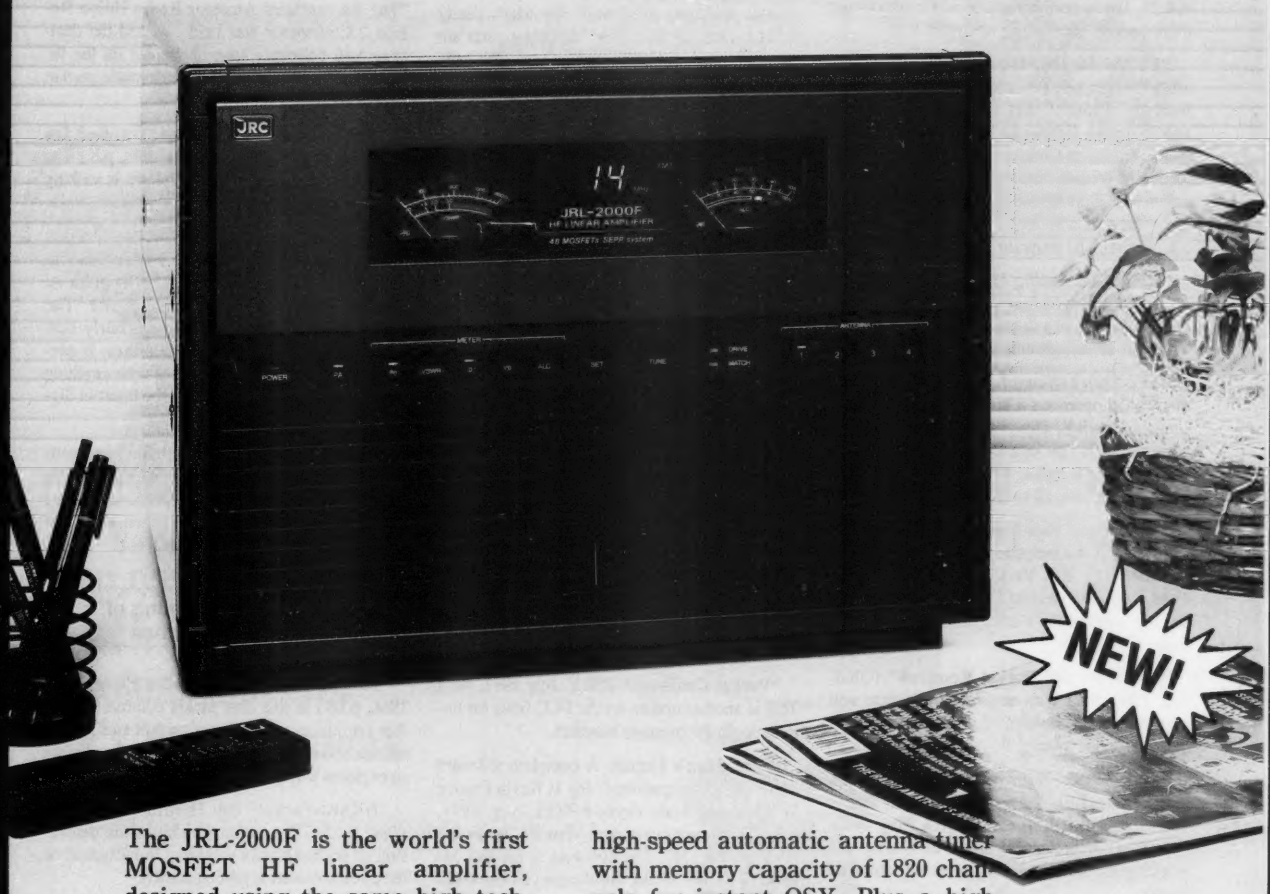


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Some are better than others, but most can be dramatically improved." A schematic is included for this project.

**"TexNet Packet-Switching Network.** An overview of a highly successful and efficient packet radio network." (by Greg Jones WD5IVD, Oct. 1989, p.54.) TexNet is "an inexpensive, multi resource, four port, high-speed 'backbone,' datagram-based amateur packet switching system." The author presents an overview of a very fast 9600 baud amateur network.

**"Amateur Packet Networking.** Going beyond just AX.25 . . . " (by Brian Lloyd WB6RQN, Oct. 1989, p.60.) "This article covers some networking concepts, explains where the original popular ham packet protocol, AX.25, falters, and compares and contrasts the more popular networking protocols."

**"TCP/IP for the Macintosh.** Now this powerful PC runs one of packet radio's hottest networking systems!" (by Doug Thom N6OYU and Dewayne Hendricks WA8DZP, Oct. 1989, p.68.) Transport Control Protocol/Internet Protocol can provide hams with many capabilities never before available in packet communication. The article includes an address where you can purchase the program on disk for $5.

**"HF Packet Tuning Aid.** Spot-on tuning every time!" (by John Reed W6IOJ, Oct. 1989, p. 80.) Build this easy to use packet signal synthesizer. The schematic and parts list are included.

**"The Quickchanger.** This makes mixed-mode/band operation a breeze." (by Howard E. Cann KA3MRX, Oct. 1989, p.84.) This easy home-brew is "an interface box that lets you switch a single mike, a TNC, a phone patch, and two speakers, all to either HF, VHF, or off."

**"The Great San Francisco Quake '89.** Hams fulfill the purpose of the amateur radio service." (by Bill Pasternak WA6ITF, Feb. 1990, p.18.) Digipeating Packeteers prevailed in the big earthquake's emergency communications.

**"Grant for HF Packet Research"** (QRX, Apr. 1990, p.7.) Tiny news item. "A team will investigate the benefits of diversity reception for HF packet radio . . . "

**"SAREX-90.** Ham-in-space shuttle missions." (by Tom Clark W3IWI, Ron Parise WA4SIR, and Bill Tynan W3XO, May 1990, p.9.) This comprehensive article on hearing and working the astronauts includes a section on packet.

**"SatelLife Packet."** (QRX, June 1990, p.7.) Experts in Boston and Moscow are teaming up to save lives by bringing lightning-fast medical data to third world doctors via packet.

**"TNC Connect Alarm.** Did anyone call when I was out?" (by Mark Schmidt DA1AU/WB9EGA, June 1990, p.14.) This easy home-brew is like an answering machine for your packet radio station.

**"PK-232 Connect Memory.** Lets you know what you missed. (by William Bleher W8GQL, July 1990, p.44.) This simple contruction project lets you know if a connection occurred to your packet station when you were away.

**"SAREX Packet Hints."** (QRX, Nov. 1990, p.7.) Advice for successful shuttle communications including using the proper callsign.

**"Portable Backpack Packet Station:** Behold the Back Packet! Go take a hike with packet radio." (by John Trent Adams NW6H, Dec. 1990, p. 9.) You can " . . . provide reliable communications at a moment's notice from any weird location . . . " with this innovative project. "The BackPacket consists of a PacComm Micropower-2 TNC, an Epson PX-8 laptop, a Yaesu FT-203 HT, a 7 amp-hour sealed lead-acid battery all encased in a sturdy Ensolite laminate in a Jansport daypack."

**"Upgrade your HD-4040.** KISS your Heath D-4040 and keep X.25 too!" (by Mark Dieter N2BLI, Dec. 1990, p.19.) "Very few parts are required to install this upgrade in your TNC: the TAPR KISS TNC 1 EPROM, a good quality DPDT switch, and a few strands of small-gauge wire."

**"W1AW Packet BBS."** (QRX, Jan. 1990, p.7.) "The ARRL has reinstated its packet radio BBS, W1AW-4, after more than a year off the air."

**"Packet with the Microsats.** The secrets of success." (by David Medley KI6QE, March 1991, p.9.) A seasoned ham (sorry) shares his favorite tidbits for getting the most out of orbiting packet.

**"The End of Packet."** (QRX, April 1991, p.7.) A chill was sent through the packet radio community when eight amateurs were fined $300 each in connection with a political message. This appears to be the first time the FCC has penalized intermediate packet station operators for a message they did not originate.

**"New Rules Sought"**(QRX, May 1991, p.7.) "The FCC has accepted a petition requesting that primary responsibility for the content of all automatically retransmitted signals be placed on the originating station."

**"Packet Challenge"** (QRX, July 1991, p.7.) This is another update on the FCC fines for automatic packet message handlers.

**"Poor Man's Packet.** A complete software TNC for PC compatibles!" (by F. Kevin Feeney W2EMS and Andy Payne N8KEI, Aug. 1991, p.8.) This home-brew uses your PC to do the work of the TNC. The software is on disk instead of ROM. "Using this design you can build a simple, inexpensive packet communications system." It's a good way to get your feet wet in packet.

**"The Lappack.** Extended portable power for your laptop computer." (by Brian Kassel W5VBO, March 1992, p.52.) This construction project provides the 9.2 VDC required by some laptops by converting power from a 12VDC source.

**"Packet on the Mac.** Connect with the world without a TNC." (by Dexter Francis KD6CMT, Oct. 1992, p.8.) This article has all the information you need to build a 'PacketMac Modem,' which will eliminate the need for an external TNC. A PC board is available.

**"Packet Radio and Emergency Communications.** Public safety enters the digital world." (By Richard Ferguson KAØDXM, Oct. 1992, p.42.) A comprehensive look at emergency packet is presented, including what you'll need to know to start a successful ham radio emergency group.

**"ARRL Kills Automatic HF Packet Forwarding."** (QRX, Nov. 1992, p.7.) In this short news item, the league has decided to accept the Digital Committee's recommendation that unattended HF packet forwarding should not be allowed.

**"IARU Region 2 Meeting Formally Recognizes HF Packet."** (QRX, Dec. 1992, p.6.) "The International Amateur Radio Union Region 2 Conference was held . . . and the decisions will definitely have an impact on the future of high-frequency fully-automatic packet radio forwarding worldwide."

**"Packet Radio Equipment Needed for Poland Center."** (QRX, March 1993, p.8.) The American Council for Polish Culture is seeking new or used packet equipment to enhance training opportunities.

**"Digital Satellite Gateway Nodes.** How to get on OSCAR 22 with an HT." (by John A. Hansen WAØPTV, March 1993, p.19.) "The satellite gateway node system is a fairly new development in packet radio satellites. It permits region-wide access by hams with anything from very modest equipment to the latest in digital satellite technology."

**"Portable Packet Digipeater for Emergency Service."** (by John Neeley K6YDW, June 1993, p.16.) Build this highly portable, battery powered digipeater. Parts list, schematics, and PC board design are all included.

## Chronological Listing of *73* Packet Columns

"NK6K>Packet" (by Harold Price, May 1986, p.86.) In this first packet column, the author introduces you to some **packet radio definitions** and reviews the history of packet. He also explains why packet is virtually error-free.

"NK6K>Packet" (by Harold Price, June 1986, p.76.) The author continues his discussion of **packet basics** including a discussion of the costs involved in getting started.

"NK6K>Packet" (by Harold Price, July 1986, p.88.) A discussion of the **new packet products** offered at Dayton this year.

"NK6K>Packet" (by Harold Price, Sept. 1986, p. 88.) **Packet in other lands** is discussed, including Japan, South Africa, and the U.K.

"NK6K>Packet" (by Harold Price, Oct. 1986, p. 60.) The author discusses **baud rate** and how it is related to transceiver delay time.

"NK6K>Packet" (by Harold Price, Nov. 1986, p.74.) The author addresses a variety of

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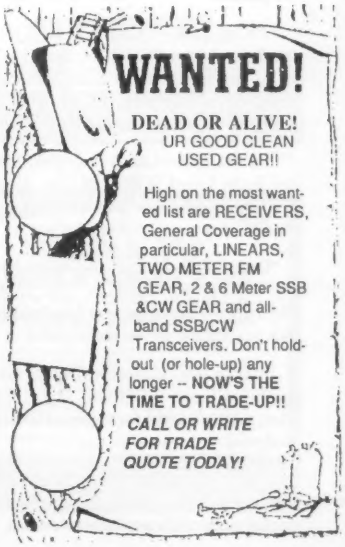
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subjects including **moon bounce** on 432 MHz and third-party traffic in relation to packet operation.

"NK6K>Packet" (by Harold Price, Dec. 1986, p.66.) The first large-scale **packet radio survey** questionnaire is presented.

"NK6K>Packet" (by Harold Price, Jan. 1987, p.70.) The author discusses **high-speed modems,** HF forwarding networks, and restricted BBSs.

"NK6K>Packet" (by Harold Price, Feb. 1987, p.66.) The author discusses what should be included in a **packet message header.**

"NK6K>Packet" (by Harold Price, March 1987, p.82.) Results from the **packet poll** of December 1986 are presented.

"NK6K>Packet" (by Harold Price, Apr. 1987, p.76.) The author **answers questions** from readers. Topics include the recent survey and auto-forwarding.

"NK6K>Packet" (by Harold Price, May 1987, p.54.) The author reviews his **first year** writing a packet column.

"NK6K>Packet" (by Harold Price, June 1987, p.58.) The author delves into **coded packet transmissions.**

"NK6K>Packet" (by Harold Price, July 1987, p.56.) The author discusses the **AEA packet line,** OSCAR 12, and the FO-12 BBS.

"NK6K>Packet" (by Harold Price, Aug. 1987, p.50.) The author discusses the virtue of a **proposed FCC STA** (special temporary authorization) to allow HF stations to run unattended.

"NK6K>Packet" (by Harold Price, Sept. 1987, p.68.) The author continues his discussion of the **HF STA.**

"NK6K>Packet" (by Harold Price, Oct. 1987, p.54.) The author revisits the August 1987 packet issue and discusses using **laptops for packet.**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Dec. 1987, p.59.) In his first packet column, the author discusses **transceiver enhancements** to better facilitate error-free packet communications.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Jan. 1988, p.80.) The author discusses **protocols** and layer definitions.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Feb. 1988, p. 76.) The author looks at **narrow bandwidth FM** radios in common use on packet radio.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Mar. 1988, p.76.) The author discusses **equalization and modems.**

"ATV" (by Mike Stone WBØQCD, Apr. 1988, p.58.) The author discusses **interfacing packet radio with amateur television.**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Apr. 1988, p.67.) The author shows how packet radio can be used in an **emergency.**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, June 1988, p. 60.) This column is devoted to building a **duplex digipeater for 2 meters** that requires little hardware and no software.

"QRP" (by Mike Bryce WB8VGE, June 88, p.67.) A short blurb describes **low power packet** operation.

"RTTY Loop—Amateur Radio Teletype" (by Marc I. Leavey, M.D., WA3AJR, August 1988, p.63.) Discussion of an **AEA PC Pakratt** program which can handle packet, Baudot, FAX, Morse, and AMTOR.

"Circuits—Great ideas from our readers." **"Portable Packet"** (by Dick Peters WA1PWF, Feb. 1989, p.76.) A very simple circuit which allows you to use your TNC with an ICOM HT.

"DX—Hams Around the Word" (by Chod Harris VP2ML, Feb. 1989, p.79.) **Packet DX Spotting Networks,** packet conference bulletin board, and packet cluster are discussed.

"73 International" **"Packet Radio in South Africa"** (by Peter Strauss ZS6ET, Apr. 1989, p.104.) A roundup of packet ham radio activities in the Republic of South Africa.

"Letters From the Hamshack." **"Packet Racket"** (Letter by John Shelley WA1IAO/response by Brian Hastings NS1B, May 1989, p.92.) Mr. Shelley calls packet an "electronic plague" while Mr. Hastings responds that clinging to the past could kill ham radio.

"Circuits—Great ideas from our readers." **"Packet/Voice Switch Box."** (by Robert L. Dingle KA4LAU, Aug. 1989, p.58.) A simple circuit you can build to avoid having to disconnect the input to the TNC and reconnecting the microphone in order to swich from packet to voice.

"Ask Kaboom—The Tech Answer Man" (by Michael Jay Geier KB1UM, Sept. 1989, p.61.) The author answers reader inquiry about a flickering DCD light when there is no signal on his **MFJ 1270 TNC.**

"Welcome, Newcomers!" (by Brian P. Lloyd WB6RQN, Oct. 1989, p.6.) A handy one page introduction to **packet terms and definitions.**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Nov. 1989, p.50.) The author, returning from a one-year hiatus, discusses **packet bulletin boards and protocol.**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Dec. 1989, p.46.) Topics this month include **courtesy using packet** on the ham bands and making AX.25 more efficient.

"Circuits—Great ideas from our readers."**"3-Position, Multi-Mode Switch Box."** (by David K. Pelaez, Dec. 1989, p.70.) Build an easy switch-box for RTTY, packet, FAX, and SSTV.

"Ask Kaboom—The Tech Answer Man" (by Michael Jay Geier KB1UM, Dec. 1989, p.72.) Fix a common cause of **QRM** on 2 meter mobile packet radio.

"Letters From the Hamshack." "Closer Look at **ROSE**" (A letter by Thomas A Moulton W2VY and response by Linda Reneau KA1UKM, Dec. 1989, p.76.) A reader responds to comments about the ROSE networking solution in a recent packet issue of *73*.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Jan. 1990, p.58.) Topics this month include two packet conferences, new products, and the **ARPANET/Internet.)**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Feb. 1990, p.58.) The author discusses ways in which **packet can be improved,** including better frequency coordination and more channels.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, March 1990, p.56.) The author talks about doing **800 Hz shift with the PK-232** and about a California grocery store which caters to computer hackers.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Apr. 1990, p.54.) The author touches on the **universal interface,** PTT level converter, and the stagnation of packet radio.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, May 1990, p.58.) The author discusses **smart packet software** and especially SAREX features.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, June 1990, p.48.) The author discusses **10 meter packet** including upper and lower sideband operation.

"Hamsats—Amateur radio via satellite." (by Andy MacAllister WA5ZIB, June 1990, p.51.) **Modems for digital hamsat operation** are discussed.

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, July 1990, p.64.) The author answers mail and discusses the **"TAPR packetRADIO."**

"Packet Talk—Latest in Digital Hamming" (by Brian Lloyd WB6RQN, Aug. 1990, p.76.) Includes more on **800 MHz shift** and more on **10 meter packet** discussion from a previous column.

"Homing In—Radio direction finding." (By Joe Moell P.E. KØOV, Oct. 1990, p.52.) The author discusses **triangulation** by packet.

"Hamsats—Amateur radio via satellite." (by Andy MacAllister WA5ZIB, Dec. 1990, p.81.) A discussion on **packet via satellites** is presented, including **picture packets** from space.

"Hamsats—Amateur radio via satellite." (by Andy MacAllister WA5ZIB, Apr. 1991, p.70.) How to copy the **Soviet *Mir* Space Station** on FM packet.

*Continued on page 18*

# FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposide this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to 73.

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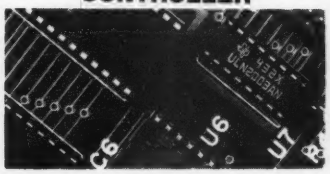

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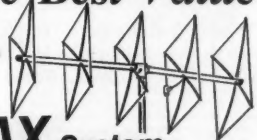

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*Continued from page 16*

"RTTY Loop—Amateur Radio Teletype" (by Marc I. Leavey, M.D. WA3AJR, Aug. 1991, p.69.) **"Packet or RTTY**—Which is better?" The author compares and contrasts two of amateur radio's popular digital modes.

"Hamsats—Amateur radio via satellite." (by Andy MacAllister WA5ZIB, Dec. 1991, p.62.) The author talks about **9600-bit-per-second packet** operation via low earth satellites.

"RTTY Loop—Amateur Radio Teletype" (by Marc I. Leavey, M.D. WA3AJR, Feb. 1992, p.62.) The author walks a packet newcomer through his **anxiety** over the new digital mode.

"Packet & Computers." (by Jeff Sloman N1EWO, Aug. 1992, p.62.) In the first installment of his new column, the author reviews a number of helpful suggestions for **network users and sysops.** Topics include PBBS directory services and the WB7TPY Packet/Internet Gateway.

"Packet & Computers." (by Jeff Sloman N1EWO, Sept. 92, p.78.) Subjects include **tuning up** your packet station, networks, repeaters and portable packet.

"RTTY Loop—Amateur Radio Teletype" (by Marc I. Leavey, M.D., WA3AJR, Oct. 1992, p.54.) The author explains to an RTTY user what he needs to know to take that **big leap into packet.**

"Packet & Computers." (by Jeff Sloman N1EWO, Oct. 1992, p.64.) Subjects this month deal with **portable packet** operation: batteries, TNCs, and carrying cases.

"Packet & Computers." (by Jeff Sloman N1EWO, Nov. 1992, p.62.) This month's column is devoted entirely to a **digital radio glossary.**

"Packet & Computers." (by Jeff Sloman N1EWO, Dec. 1992, p.74.) Includes good news about the Internet and highlights of the **NØARY BBS.**

"Packet & Computers." (by Jeff Sloman N1EWO, Jan. 1993, p.72.) A discussion of **digital signal processing and digital filters** is presented.

"Packet & Computers." (by Jeff Sloman N1EWO, Feb. 1993, p.66.) This month's column focuses on **TexNet.**

"Packet & Computers." (by Jeff Sloman N1EWO, March 1993, p.48.) The main topic this month is understanding **asynchronous communications.**

"Packet & Computers." (by Jeff Sloman N1EWO, Apr. 1993, p.40.) In this first installment of a series, the author tells you how to quiet down the **RFI** in your hamshack.

"Packet & Computers." (by Jeff Sloman N1EWO, May 1993, p.40.) The author presents the second half of his discussion on **asynchronous communications.** (See March 1993.)

"Packet & Computers." (by Jeff Sloman N1EWO, June 1993, p.50.) This month's column looks at how packet operators (and hams in general) need to improve their **behavior** on the airwaves.

"Packet & Computers." (by Jeff Sloman N1EWO, July 1993, p.58.) This month, the author covers **hierarchical addressing,** the system by which packet traffic is routed.

## Chronological Listing of *73* Packet Product Reviews

"Seeing Packet Radio With Different Eyes. The **Versabraille 2** system allows blind hams to get connected." (by Jeffrey Bishop 7FDS, Aug. 1986, p.48.) The author reviews Telesensory Systems Inc.'s word processor and communicator for the blind. It can be used with nearly any TNC to facilitate sightless packet operation.

**"MFJ-1270 TAPR-2 Packet TNC"** (by Marc Stern N1BLH, June 1986, p. 24.) The author reviews " . . . packet (for) the common man . . . a TAPR NC-2 clone that's every bit as good, if not better, than the original."

**"73's Packet Buying Guide"** (Aug. 1986, p.88.) Table lists company, product, features, and price.

**"AEA PK-232 PAKRATT"** (by Perry Dorham KW1O, Dec. 1986, p.22.) Advanced Electronic Applications put all of ham radio's digital modes into one station controller. The unit includes Morse, Baudot RTTY, ASCII, AMTOR, and packet.

"The **Heath HK-21 TNC.** Hand-Held TNC!" (by Tom Gilchrist N7KHU, March 1989, p.38.) "Heath calls the HK-21 a 'Pocket Packet' for a very good reason. It's a compact, self-contained TNC with a built-in personal packet bulletin board system (PBBS)."

**"DRSI PC*Packet Adapter.** Revolutionizes the PC/transceiver interface." (by Brian Lloyd WB6RQN, Oct. 1989, p.20.) "This board plugs in to your IBM or compatible and turns it into a complete packet radio communications system."

**"GRAPES 56 Kb Modem.** We've come a long way from 1200 baud packet." (by Philip R. Karn, Jr. KA9Q, Oct. 1989, p.42.) "How would you like to be able to send the equivalent of a standard 5.25" IBM PC floppy disk (360 Kbytes) by packet radio in less than two minutes? How about transmitting telephone-quality digital voice over the air?" The author reviews a fast modem distributed by the Georgia Radio Packet Enthusiasts Society.

**"PacComm's NB-96 High Speed Modem.** Dramatically increase packet data rates without buying a new packet system." (by Thomas A. Moulton W2VY and Robert A. Buaas K6KGS, Nov. 1989, p.30.) A review of a 9600-baud modem that enhances most packet radio systems with no need to change rigs.

**"Pkt-GOLD Multimode.** Your software window into the world of digital communications!" (by Marc Stern WA1R, Aug. 1991, p.20.) "Pkt-GOLD Multimode is a program that turned out to be one of the best implementations of multimode controller software I have seen."

"The **TAPR METCON-1 Kit.** Add telemetry and control to your packet station." (by Bill Brown WB8ELK, Aug. 1991, p.34.) "How would you like to have the ability to read sensors or control circuitry from a remote location via packet radio?" With this kit, you can do it.

"The **Kantronics KTU Telemetry Unit with Weathernode EPROM.** Remote weather observations via packet!" (by Dick Goodman WA3USG, Aug. 1991, p.46.) "The flexibility in the way weather data may be captured and presented should meet the requirements of the most demanding amateur and professional meteorologists."

"The **BayCom Packet System.** Run packet without a TNC." (by Dick Goodman WA3USG, Dec. 1991, p.20.) This system is actually composed of two parts: " . . . a shareware program called 'BayCom,' and a simple modem." The reviewer calls it superb.

"The **Kantronics KPC-3.** Full-featured packet in a compact package." (by Mark T. Schmidt WB9EGA, Oct. 1992, p.30.) This tiny packet communicator offers a long list of features, including WEFAX and KA-Node.

"The **Tigertronics BP-1** Packet Modem. Just add one computer for instant packet. (by Bill Brown WB8ELK, Dec. 1992, p.52.) "How would you like to get on packet for less than $50? If you have an IBM compatible computer laying around, you only need to add the BP-1 Packet Modem and run a software packet program."

"The **AEA DSP-2232."** (by Jeffrey Sloman N1EWO, March 1993, p.17.) This product" . . . is a great example of how DSP (digital signal processing) can bring intelligence and flexibility to a product traditionally hardwired for a job."

## Special Packet Issues

On three previous occasions, we have devoted an entire issue of *73* to packet. These are "must read" issues. They were published in August 1986, August 1987, and October 1989. 73

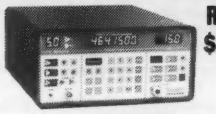
**Back issues are available while they last for $4.00 each ppd. Reprints are available for $3.00 per article. Send orders to *73 Amateur Radio Today,* Reprints, 70 Route 202N, Peterborough, NH 03458.**

# RAMSEY ELECTRONICS

**COM-3**
**$2995.00**

## 2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.



**RSG-10**
**$2495.00**

## SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • – 130 to + 10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

# FREQUENCY COUNTERS

**CT-70 7 DIGIT 525 MHz** | **CT-90 9 DIGIT 600 MHz** | **CT-125 9 DIGIT 1.2 GHz**

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

**NEW CT-250 2.5 GHZ**

### ACCESSORIES FOR COUNTERS

| | |
|---|---|
| Telescopic ship antenna—BNC plug, WA-10 | $11.95 |
| High impedance probe, light loading, HP-1 | $16.95 |
| Low-pass probe, audio use, LP-1 | $18.95 |
| Direct probe, general purpose use, DC-1 | $16.95 |
| Tilt bail, elevates counter for easy viewing, TB-70 | $ 9.95 |
| Rechargeable internal battery pack, BP-4 | $ 8.95 |
| CT-90 oven timebase, 0.1 ppm accuracy, OV-1 | 59.95 |

### ALL COUNTERS ARE FULLY WIRED & TESTED

| MODEL | FREQ. RANGE | SENSITIVITY | DIGITS | RESOLUTION | PRICE |
|---|---|---|---|---|---|
| CT-50 | 20 Hz–600 MHz | <25 mV to 500 MHz | 8 | 1 Hz, 10 Hz | $189.95 |
| CT-70 | 20 Hz–550 MHz | <50 mV to 150 MHz | 7 | 1 Hz, 10 Hz, 100 Hz | $139.95 |
| CT-90 | 10 Hz–600 MHz | <10 mV to 150 MHz<br><150 mV to 600 MHz | 9 | 0.1 Hz, 10 Hz, 100 Hz | $169.95 |
| CT-125 | 10 Hz–1.25 GHz | <25mV to 50 MHz<br><15 mV to 500 MHz<br><100 mV to 1 GHz | 9 | 0.1 Hz, 1 Hz, 10 Hz | $189.95 |
| CT-250 | 10 Hz–2.5 GHz typically 3.0 GHz | <25 mV to 50 MHz<br><10 mV to 1 GHz<br><50 mV to 2.5 GHz | 9 | 0.1 Hz, 1 Hz, 10 Hz | $249.95 |
| PS10B Prescaler | 10 MHz–1.5 GHz, divide by 1000 | <50 mV | Convert your existing counter to 1.5 GHz | | $89.95 |

## SPEED RADAR
**$89.95 complete kit**
**SG-7**

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

## BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter ..... $59.95

## 2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit ..... $34.95
TR-1, RF sensed T-R relay kit $11.95

## FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88-108 MHz FM band up to 300' except for hi power FM-4 that goes up to 1/2 mile.
FM-1, basic unit ..... $5.95
FM-2, as above but with added mike preamp ..... $7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away ..... $14.95
MC-1, miniature sensitive mike cartridge for FM-1,2,4 ..... $2.95

## MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
Complete kit MD-3 .. $19.95

## MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 $12.95

## PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly "NO TUNING". Includes FREE disk software, PC Board and Full Documentation.

| | | |
|---|---|---|
| KIT | P-64A ..... | $59.95 |
| | P-IBM ..... | $59.95 |
| CASE | CPK ..... | $12.95 |

## LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
Each kit ..... $17.95

## TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 $6.95

## VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit. ..... $6.95

## TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit ..... $14.95

## NEW
## SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 ..... $29.95 Case-CSP ..... $12.95

## TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
TS-4 kit ..... $9.95

## LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug." Transmitter + receiver set, LB56 .. $19.95

## FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit ..... $19.95

## SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
BN-9 kit ..... $6.95

## BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit ..... $14.95

# •2 METERS •223 MHz •440 MHz

**$149.95**

# FANTASTIC FM TRANSCEIVERS
## SYNTHESIZED—NO CRYSTALS

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? . . . . No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

| | |
|---|---|
| FX-146 kit (2 Meters) | $149.95 |
| FX-223 kit (1¼ Meters) | $149.95 |
| FX-440 kit (3/4 Meters) | $169.95 |
| CFX matching case set | $ 24.95 |

## 2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested ..... $89.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested ..... $89.95

# QRP TRANSMITTERS HAM RECEIVERS

## 20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands ..... $29.95
(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP ..... $12.95

## 20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in QST and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands ..... $29.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR ..... $12.95

## E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit ..... $24.95
Matching case knob set, CCW ..... $12.95

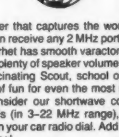
## ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit ..... $24.95
Matching case & knob set, CAA ..... $12.95

## SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit ..... $29.95
Matching case & knob set, CSS ..... $12.95

## SHORTWAVE RECEIVER



Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI ..... $29.95
Shortwave converter kit, SCI ..... $27.95
Matching case set for SRI, CSR ..... $12.95
Matching case set for SCI,CSC ..... $12.95

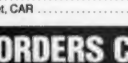
## 2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit ..... $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR ..... $12.95

## FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit ..... $29.95
Matching case set, CFM ..... $12.95

## AIRCRAFT RCVR



Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit ..... $24.95
Matching case set, CAR ..... $12.95

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. •Add $3.75 for shipping, handling and insurance. •For foreign orders add 20% for surface mail. •COD (U.S. only): add $5.00. • Orders under $20, add $3.00. •NY residents add 7% sales tax. •90-day parts warranty on kit parts. •1-year parts & labor warranty on wired units.

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**6VDC, 4PDT KH STYLE RELAY**

***SPECIAL PURCHASE!!***
Omron # MYQ4-02-VH-6VDC
6 Vdc, 37.5 ohm coil. PC pins.
4PDT, 5 amp contacts.
1.07" X 0.82" X 1.41" high.
**CAT # 4PRLY-6PC**
$2.50 each
10 for $20.00

**REDUCED PRICE!**
**4 (USED) AA RECHARGEABLE BATTERIES**

Battery pack with 4 AA nickel-cad batteries in series to make a 4.8 volt pack. Batteries have soldertabs and can be separated and reconfigured.
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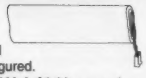


**12 VDC LATCHING RELAY**

Midtex # 327-21B200
12 Vdc, 400 ohm dual coil latching relay. DPDT, 2 amp contacts. Fits 16 pin DIP socket. 0.8" X 0.4" X 0.33". UL listed.
**CAT# LRLY-125** $2.00 each

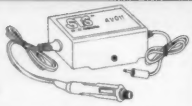
**VIDEO/RF MODULATOR**

Originally made for use with the Commodore computer, these good quality video modulators were probably designed for 9 Vdc use, but they operate well on 6-12 Vdc. They accept color video and audio, and a selector switch is provided for output to channel 2 or 3. Easy to hook-up. Requires a 6-12 Vdc power supply or wall transformer and a connector to interface with your audio/video source. RCA jack output. Hook-up instructions included. 3" X 1.47" X 0.75".

**CAT# AVMOD-3** $5.00 each

**DC-DC CONVERTER**

Satellite Technology Services, Inc.# AV 011
Input:
13.75 Vdc to 27.5 Vdc
Output:
13.75 Vdc @ 1.3 amps
Plugs into cigar lighter receptacle in car or airplane. Converts, filters and regulates voltage for use with 12-14 Vdc appliances. Fused cigar lighter plug on heavy duty 3 ft cable. 4 1/2 ft cord on output side terminates with a small DC co-ax power plug that, in most cases, will need to be cut-off and replaced with another type of plug. Ideal for powering portable TVs, communications equipment etc.
**CAT# AV-011** $5.00 each



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# UPDATES

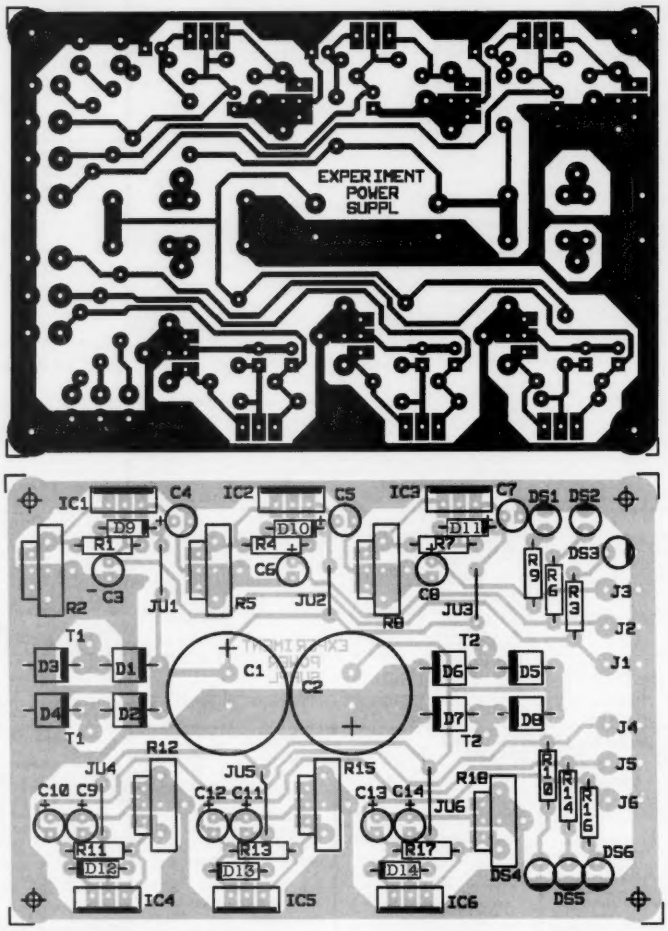


*Figure A. Corrected parts placement diagram for the Experimenter's Power Supply.*

**An Experimenter's Power Supply**

See the above article by KF9GX in the May 1993 issue of *73*, page 30. Here is a corrected parts placement diagram with the IN4001 diodes properly located.

*Continued on page 25*

**Heterodyne Headache #14.226.5**

Get fast relief with a **Magic Notch®** automatic notch audio filter

Magically removes all heterodynes caused by tuners, carriers, CW, computer RFI and other similar QRM!

Why listen to carriers?
The MagicNotch filter:

- is fully automatic. No tuning is necessary.
- easily installs between the rig and an external speaker or headphones.
- can be left on all the time while operating SSB.
- shows filter operation with its 2 color LED.
- allows you to work an s4 SSB signal under a 20 over 9 carrier.
- requires 12 VDC—usually available from the accessory jack on your rig.

30 day money back guarantee

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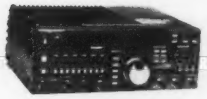

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## "YAESU Ham and Business Radios"

**FT-767GX, FT-890, FT-747GX, FT-990, FRG-8800, FRG-100B FT-736R, FT-1000D, FT-416/816, FT-530, FT-5200, FT-2400, FT-470, FT-530- FT-411E**

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A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Buttermut, Multi-Band

**"TS-50S", TS450S/AT, R-5000, TS-850S, TM 241/A/441A, TR-751A, Kenwood Service Repair, TS140S, TS690S, RZ-1, TS-790A, TS950SD, TH-78A, TH28/48A, TM-941A, TM-741A, TM-732A, TM-641A, TM-742A.**

| YAESU | ICOM |
|---|---|
| FT-23R/26/76 | IC2/3/4SAT |
| FT411E-811-911 | IC02AT/2SRA |
| FTH-2008/7008 | IC2/4GAT/24AT |
| | IC-A21/U16 |

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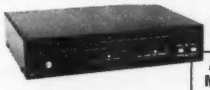

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CIRCLE 41 ON READER SERVICE CARD

# FM Packet Deviation Meter

## *Put your packet station on the money for 20 bucks.*

by Steven R. Sampson N5OWK

There are a lot of "plug-and-play" amateurs today, and many are working FM packet. While many traditional amateurs can draw a Bessel function chart with their eyes closed, this new breed of ham is a lot less technical. Many have a hard time digesting the concepts of bandwidth and frequency drift, never mind deviation. This article will help. It shows how to build a useful instrument, explains exactly why it is needed, and challenges the less-than-technical ham to expand his or her electronic expertise.

Like most newcomers to VHF packet radio, I set my system up by connecting all the cables and getting on the air. It wasn't too long before I checked my audio levels. Unlike voice, there aren't a lot of people who complain if your packet audio is too hot or too weak. Actually, I don't think anyone locally listens to the packet tones because I was hotter than a two dollar pistol. First I set my receive audio level, and this was simply an increase in volume until the TNC Data Carrier Detect (DCD) light illuminated, followed by a squelch adjustment (some TNCs can operate without squelch, and this is the better way to go). You can make a pretty good judgement about setting the transmitter audio level by listening with another radio, but the correct method is to use a deviation meter. You won't find inexpensive deviation meters at any radio store, so you're going to have to build one. This article presents a deviation meter based on William Crowl N6MWS's design from the January 1990 issue of *73 Amateur Radio Today*. The circuit uses parts available at Radio Shack, and will run about $20. Bill's circuit featured many other useful functions which I deleted from this design to make it a simple one-evening project.

Figure 1 shows the schematic. This meter is based on simple AC voltmeter principles. It picks up the AC voltage from the receiver's FM detector, amplifies, rectifies, and drives the meter movement. The first stage takes the AC voltage from a scanner or your ham rig's discriminator output, blocks the DC, and amplifies it with a gain of three. The next two op amp stages form a clever full-wave rectifier function. The positive half of the input waveform passes around the second op amp to the third, while the negative half is inverted by the second stage, causing a positive output to the third stage. Bill recommends that you not change the values of the second-stage resistors. The circuit is based on the LM-324 op amp chip. It draws about 1 mA total and will last forever on a 9 volt battery. It's very simple to put together on a perfboard. See Figure 1.

*Photo A. The FM Packet Deviation Meter makes this station complete.*

### Calibration

I've really enjoyed watching all the signals as much as listening to them, and it took a bit of analysis to figure out the best way to use the meter. After several days of monitoring signals over the air, I found that the whole range of the meter is used by various

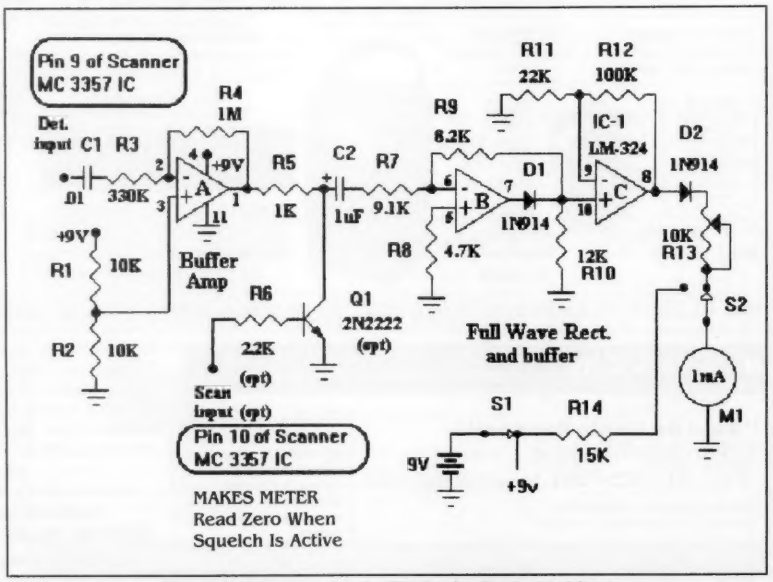


*Figure 1. Schematic for the FM Packet Deviation Meter.*

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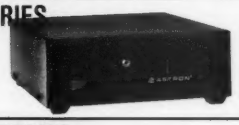

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| • LOW PROFILE POWER SUPPLY | | | | | | |
| SL-11A | • | • | 7 | 11 | 2¾ x 7⅞ x 9¾ | 11 |

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| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| • POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE | | | | |
| RS-4L | 3 | 4 | 3½ x 6⅛ x 7¼ | 6 |
| RS-5L | 4 | 5 | 3½ x 6⅛ x 7¼ | 7 |

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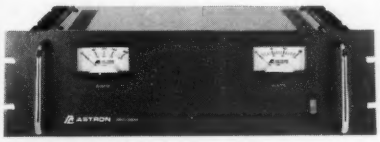

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|---|---|---|---|---|
| RM-12A | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35A | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50A | 37 | 50 | 5¼ × 19 × 12½ | 50 |
| RM-60A | 50 | 55 | 7 × 19 × 12½ | 60 |
| • Separate Volt and Amp Meters | | | | |
| RM-12M | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35M | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50M | 37 | 50 | 5¼ × 19 × 12½ | 50 |
| RM-60M | 50 | 55 | 7 × 19 × 12½ | 60 |

## RS-A SERIES

MODEL RS-7A

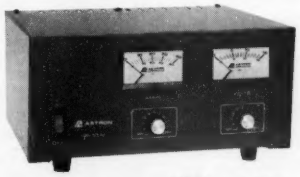
| MODEL | Colors Gray | Colors Black | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| RS-3A | | • | 2.5 | 3 | 3 × 4¾ × 5¾ | 4 |
| RS-4A | • | • | 3 | 4 | 3¾ × 6½ × 9 | 5 |
| RS-5A | | • | 4 | 5 | 3½ × 6⅛ × 7¼ | 7 |
| RS-7A | • | • | 5 | 7 | 3¾ × 6½ × 9 | 9 |
| RS-7B | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10A | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 11 |
| RS-12A | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-12B | | • | 9 | 12 | 4 × 7½ × 10¾ | 13 |
| RS-20A | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35A | • | • | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50A | • | | 37 | 50 | 6 × 13¾ × 11 | 46 |

## RS-M SERIES

MODEL RS-35M

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| • Switchable volt and Amp meter | | | | |
| RS-12M | 9 | 12 | 4½ × 8 × 9 | 13 |
| • Separate volt and Amp meters | | | | |
| RS-20M | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35M | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50M | 37 | 50 | 6 × 13¾ × 11 | 46 |

## VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

| MODEL | Continuous Duty (Amps) @13.8VDC | @10VDC | @5VDC | ICS* (Amps) @13.8V | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| VS-12M | 9 | 5 | 2 | 12 | 4½ × 8 × 9 | 13 |
| VS-20M | 16 | 9 | 4 | 20 | 5 × 9 × 10½ | 20 |
| VS-35M | 25 | 15 | 7 | 35 | 5 × 11 × 11 | 29 |
| VS-50M | 37 | 22 | 10 | 50 | 6 × 13¾ × 11 | 46 |
| • Variable rack mount power supplies | | | | | | |
| VRM-35M | 25 | 15 | 7 | 35 | 5¼ × 19 × 12½ | 38 |
| VRM-50M | 37 | 22 | 10 | 50 | 5¼ × 19 × 12½ | 50 |

## RS-S SERIES

MODEL RS-12S

• Built in speaker

| MODEL | Colors Gray | Colors Black | Continuous Duty (Amps) | ICS* Amps | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| RS-7S | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10S | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 12 |
| RS-12S | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-20S | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

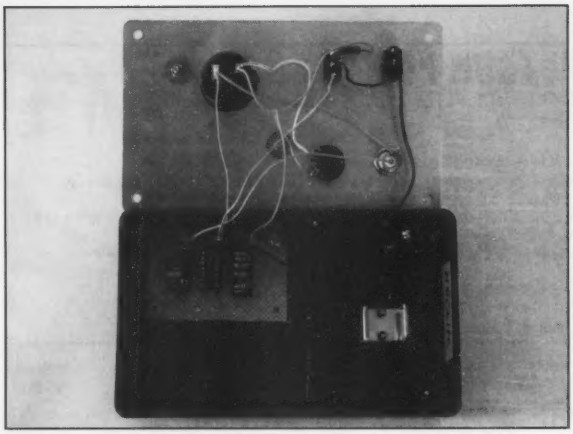


*Photo B. The FM Packet Deviation Meter with cover removed.*

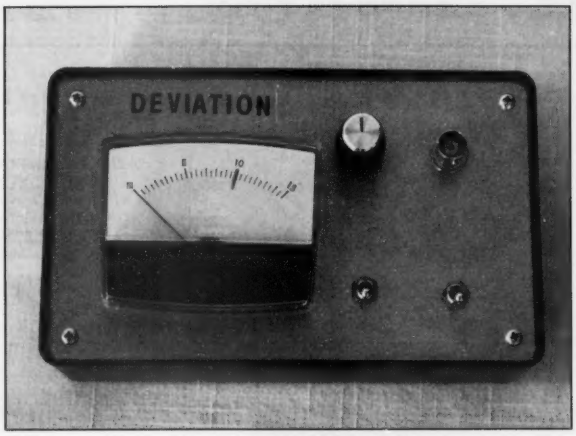



*Photo C. The finished product.*

packet stations. The really poor ones drive the meter against the 15 reading (over deviation), while no audio of course, drops it down to 0. I chose the 2/3-scale 10 reading as the best calibration setting.

Without a signal present, the discriminator outputs a noise waveform, so the calibration pot on the meter is aligned to center about this 10 reading. Calibration needs to be performed each time the frequency is changed. I usually monitor the frequency for a minute to make sure there is no interference, and then recheck calibration. Any anomaly causes me to change frequency and recalibrate.

When a packet is received, the meter will deflect downward for the good guys and upwards for the bad guys. It's important that you only measure signals that are full-quieting, as noise will throw the reading off. I find it best to keep the circuit portable and take it to the transmitter for alignment. RF is bad news for consistent readings, however. You can avoid this by both removing the scanner antenna and placing a dummy load on the transmitter. If your TNC does not have a variable deviation adjustment (a design defect), the common method is to wire a 10k ohm potentiometer into the audio line to the transmitter. Don't depend on high or low jumpers to operate correctly—these are sucker settings.

After these initial steps, I usually command the TNC into the "calibrate" mode and send the high tone. Another good method is to command the TNC to the "converse" mode and hold down the "return" key. I then quickly adjust the audio pot to my calculated 3 kHz deviation reading (about 8.0 on my meter). Unless you calibrate your meter to a known source you are only guessing about what the readings mean, as each discriminator is different. If you can't find a calibration source, you can listen to signals on the air or tune your station by ear to get an initial estimate. After a couple of days you will quickly come to know what is good and what is bad by monitoring the performance of both your own and other packet stations. The object is to get a downward deflection.

Some radios produce a noticeable difference in the two AFSK packet tones. Here, you may want to do the alignment using the more critical high tone. As you might expect, any frequency error throws everything off, so make sure both the meter's receiver and the transmitter are tuned to the same frequency.

**Deviation Basics**

Whether an FM receiver has a discriminator, ratio detector, quadrature detector, or one of the modern phase detectors makes little difference as long as the output of the detector is proportional to the amplitude of the modulating tone. When a signal is fed to the FM modulator, it varies the frequency directly. The modulated FM signal is a variable set of sidebands whose total bandwidth depends both on the frequency of modulation and the amount of deviation. The limits set by the typical narrow band FM receiver IF stage is about 15 kHz.

The best method of determining the bandwidth of an FM signal is to use a Bessel function chart, as shown in Figure 3. You use this chart to find the number of sideband pairs and then compute the bandwidth. First you calculate the modulation index:

$$P = \frac{D}{m}$$

where P = modulation index, D = peak deviation, and m = modulating frequency.

Then you examine the chart to see how many sidebands there are on each side of the carrier. If the curve comes off the baseline a line-width or more, I include that sideband. The simple bandwidth formulas you find in textbooks are all different and can be considered unreliable. Use the chart. The worse case example is an FM signal that has been deviated 5 kHz with a modulating frequency of 3 kHz. The modulation index is 1.67, giving us four sideband pairs, or eight sidebands of 3 kHz, requiring an estimated 24 kHz bandwidth to contain it. This is quite acceptable for voice when it occurs only briefly. Packet uses a high tone of 2.2 kHz, and the predicted bandwidth using 5 kHz deviation is a steady 22 kHz. Transmitting a signal with this wide a bandwidth is certain to fail with distant packet stations, and likely even to fail across town. There are two reasons: First, most rigs will clip the audio to limit the deviation, which causes distortion. The second reason is crystal stability. One rig may be tuned 1.4 kHz higher in frequency, and the other 1.4 kHz lower, and still be within crystal tolerance on 145 MHz. This gives us about 12 kHz of worse-case usable receiver bandwidth.

Using 3 kHz deviation results in a modulation index of 1.36, and the chart shows about four sideband pairs, or 8 times 2.2 kHz for a 17.6 kHz bandwidth on the more

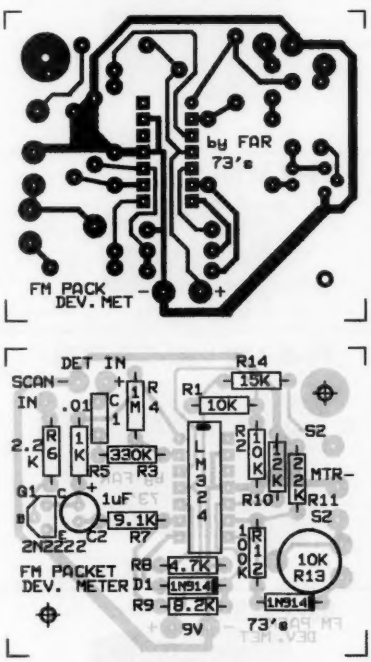


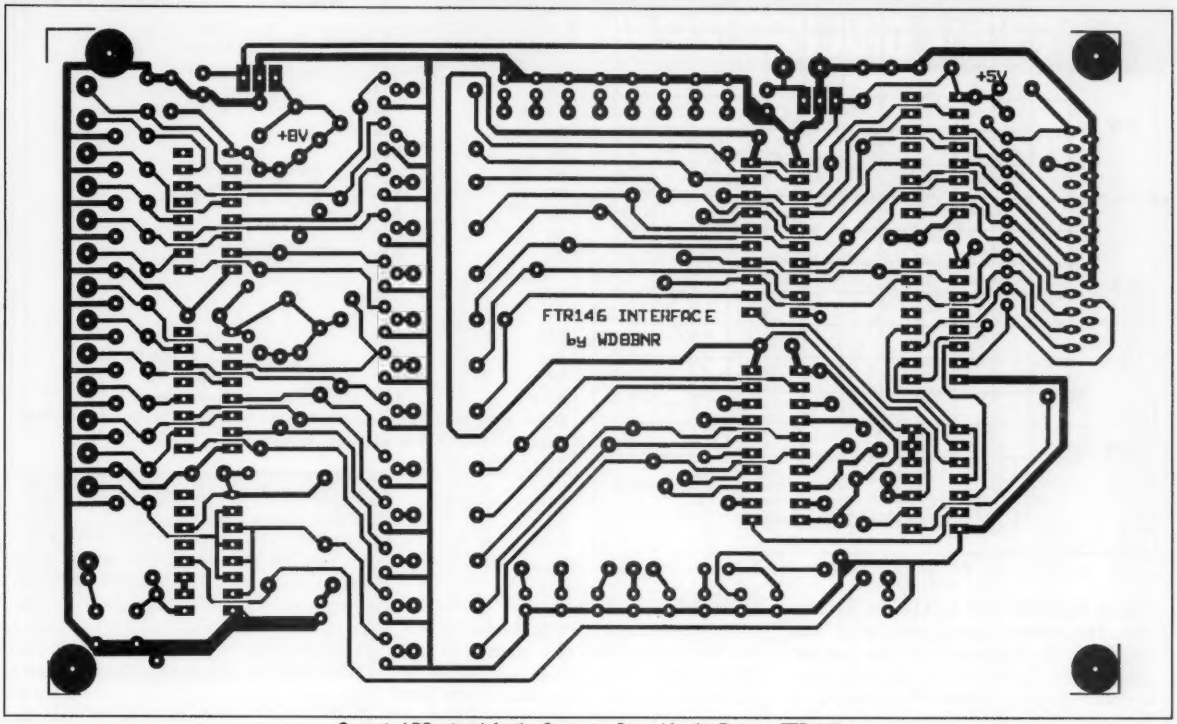

*Figure 2. PC board pattern and parts placement diagram.*

## UPDATES

Continued from page 20

### Computer Control For The Ramsey FTR-146

The above article by WD8BNR appeared on page 60 of the March 1993 issue of *73*. We printed updates in the April and June issues. With this corrected printed circuit artwork, we hope to have all the bugs out.




*Corrected PC artwork for the Computer Control for the Ramsey FTR-146.*

### The Noise Remover

See the above article by K8MKB on page 12 of the November 1992 issue of *73*. In some installations, the circuit shown in Figure 3 breaks into oscillations. Change R1 from 47k to 100k, and R3 from 680k to 470k. Put a 0.001 µF capacitor across the input side of C1 to ground, and a 0.001 µF capacitor from point A to ground (across R8).

For more output from the circuits shown in all of the figures, *exchange* the 0.0047 µF capacitor with the 0.047 µF capacitor. The series resistors R5,R9,R12 can be increased up to 4.7k ohms. If you still need more output take out C3 and C6, and replace C4,C5,C7 with a 0.47 µF tantalum. The limit adjust pot can be a 10-turn (not 25-turn) 10k pot.

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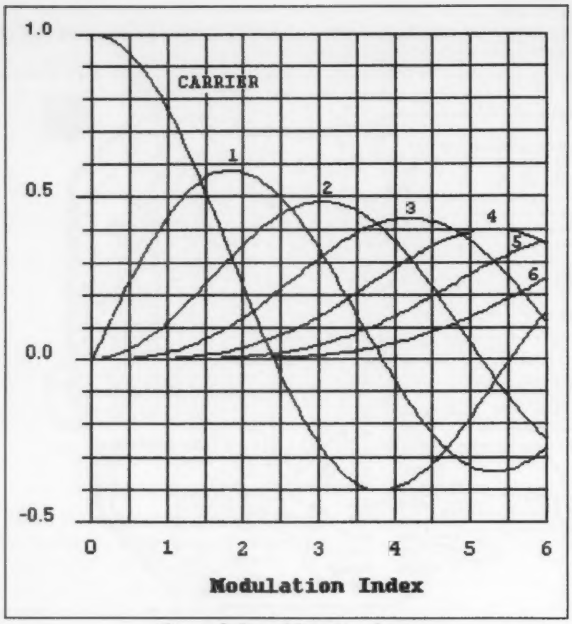


*Figure 3. Bessel function chart..*

**Parts List**

| | | |
|---|---|---|
| Case | Plastic | RS#270-627 |
| M1 | 1 mA meter | RS#270-1754 |
| J1 | BNC jack | RS#278-105 |
| IC-1 | LM-324 | RS#276-1711 |
| Q1 | 2N2222 | (Optional) |
| D1,D | @1N914 | |
| R1,R2 | 10k | All resistors 1/8 watt |
| R3 | 330k | |
| R4 | 1 Meg | |
| R5 | 1k | |
| R6 | 2.2k | (Optional) |
| R7 | 9.1k | |
| R8 | 4.7k | |
| R9 | 8.2k | |
| R10 | 12k | |
| R11 | 22k | |
| R12 | 100k | |
| R13 | 10k | Potentiometer |
| R14 | 15k | Comes with RS meter |
| C1 | 0.01 µF | Ceramic disc |
| C2 | 1 uF | Electrolytic |

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critical high tone, and 12 kHz for the low tone. This reduced bandwidth is much less affected by the frequency drift between stations, and is not distorted by the transmitter deviation limiting circuits. By listening to the audio produced by 5 kHz deviation you will notice that it sounds raspy and terrible, while the 3 kHz sounds very pure.

## Conclusion

The recommended setting for packet is 3 kHz deviation. With this meter you can quickly adjust your station, and others, to ensure that the transmitter hasn't gone into limiting, and that the bandwidth is optimized for the typical receiver. By spending a little time tuning up, you will benefit the entire local network system. I found that my station was able to connect with distant nodes that I thought were unreachable due to my power level or antenna height. Loan the meter out, and make sure everyone gets a chance to use it. Thanks go to William Crowl N6MWS for an excellent article and a repeatable circuit design, and to Joe Buswell K5JB who helped me first to calibrate the meter and then to understand FM modulation.

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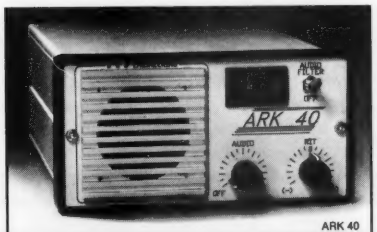


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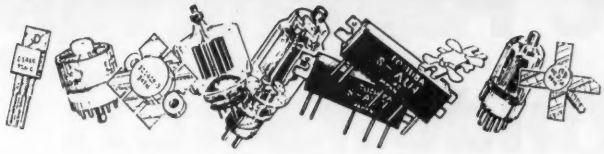

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**73 Review**

*by Jeffrey Sloman N1EWO*

# PC Pakratt for Windows

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By the time you read this, Pakratt for Windows (PPWIN) should be shipping—finally! It's been a long time, but, if you use Windows and own an AEA controller or TNC, you'll be glad you waited. The product I looked at was marked "preliminary," but it was pretty much the product that will ship, with a few rough edges still there. The fact is, even in this pre-release state, I prefer to use this product over any ham radio digital communications software on the market.

**The Next Generation**

I used PPWIN to control the new PK-900, which you will find reviewed elsewhere in this issue. Together, these two make a truly state-of-the-art digital station for the avid operator. Think of PPWIN as a very-pleasant-to-use soft front end for AEA controller hardware. It doesn't offer features found in other terminal programs like LAN-Link or PK-Gold—it wasn't designed to. Instead, you will find it an excellent replacement for learning the multitude of command line incantations required to make the hardware do all its tricks, and it offers the very user friendly Microsoft Windows environment.

PPWIN really knows AEA hardware. Through easy-to-use combo boxes—ed-

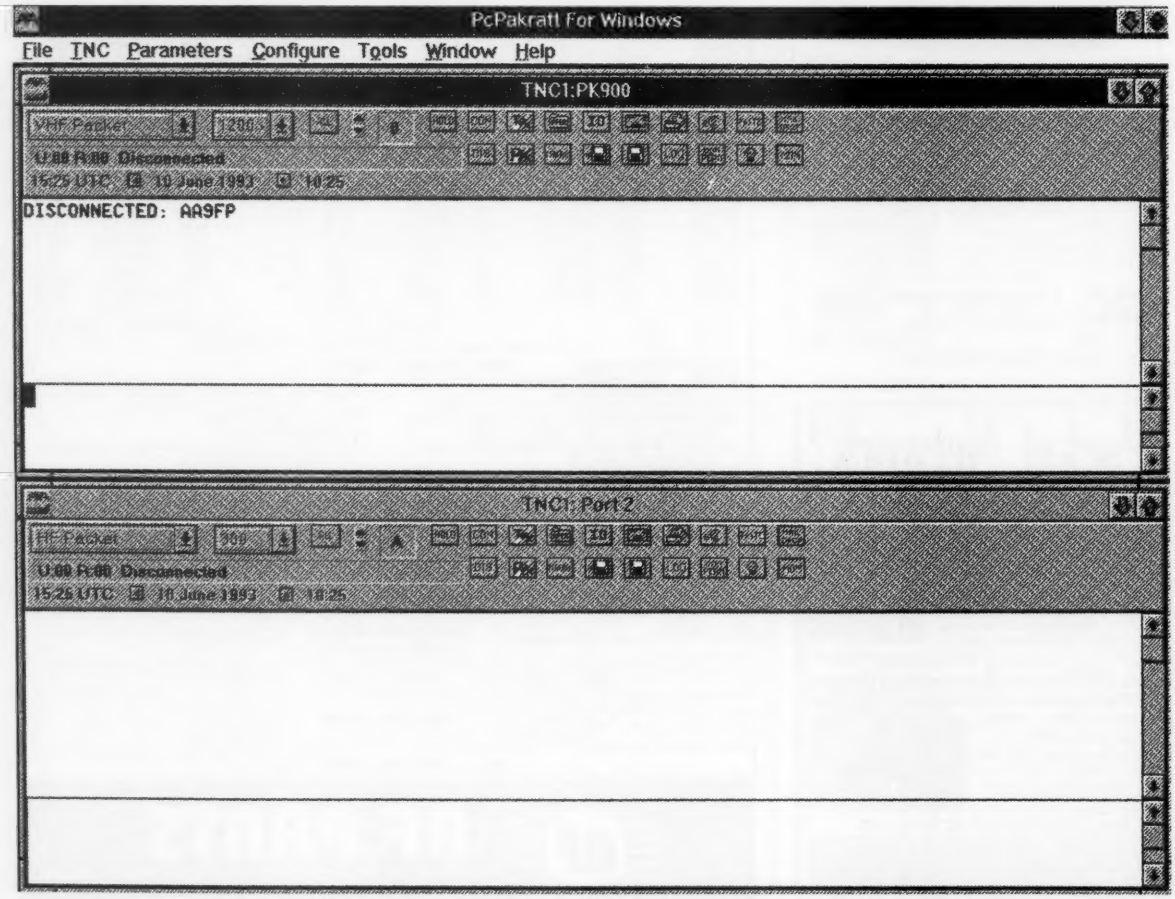


*Figure 1. From Pakratt for Windows' main screen you can do just about everything your AEA controller is capable of.*

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itable fields with drop-down lists—and directly accessible buttons, PPWIN lets you control every aspect of any AEA controller. Forget hours with the manual trying to figure out everything your new controller does: With PPWIN all the options are right in front of you—or a few mouse clicks away.

### The Main Screen

At startup, PPWIN greets you with a blank gray window and a menu bar, typical of any Windows application. The first step is to configure the program using the aptly named Configure menu. PPWIN can handle two different controllers, called TNC1 and TNC2. These can be any AEA product, from the top-end DSP-2232 to the budget-level PK-88. Selecting TNC1 from the Configure drop-down pops up a second menu which allows you to set various parameters relating to the controller.

### Set Color

This option invokes a dialog box which can be used to set the text colors for text messages displayed in the TNC1 window when it is visible. Different colors can be set for text depending upon whether it is received, echoed, or a message from the controller. These color schemes can be different for each of the controller's virtual channels. This is a very useful feature for those who run multiple connections.

### TNC Configuration

This menu option offers access to the communications parameters used to talk to the controller, and allows the specification of a particular model. It also provides an array of check boxes for selection of initialization options.

### Program Files

This option provides a way to specify files used by PPWIN for messages and other use. The files are specified by DOS path name, and push-buttons invoke standard browse boxes to help locate the desired file. There are quite a few files settable from this dialog box:

AMTOR Connect File
Buffer File
Port 2 Buffer File
Capture File Default
Macro File
Maildrop File
TNC Parameter File
Packet Connect File
PACTOR Connect File
QSO Log File
QSO Default File

### Program Configuration

This dialog lets you specify a macro to execute at startup, and one for exit—a nice feature. This can save a lot of trouble if you normally do several things at either time. Also available in this box are the buffer sizes for each port (this defaults to 64K), and check boxes to decide whether one or both controllers will automatically open on startup.

### QSO Log Defaults

This dialog offers fields for default entries in your QSO log. You can specify rig, antenna, frequency, and power. These can be overridden at logging time.

### Opening a TNC

Once you have specified the various parameters you are interested in—the only required ones are in the TNC Configuration dialog—the TNC menu on the main menu bar will show the hardware you configured. Selecting either TNC will open and initialize your choice. If you have a two-port unit, like the PK-900 used to test the program, port 2 will be an additional choice on this menu. By cleverly using the controller's host mode, PPWIN can let you access both ports concurrently—each with its own visible window.

PPWIN opens a window for each con-


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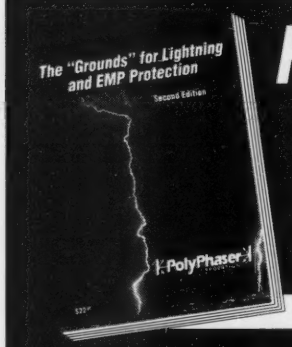


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CIRCLE 49 ON READER SERVICE CARD

troller or controller port that is opened from the TNC menu. Each of these windows has a gray bar at the top, with various combo boxes, buttons, and status windows. Below are two panes with scroll bars, one for received text and messages from the controller—the other for locally typed text. This is where you communicate with other stations, but not with the controller itself. Herein lies one of my wish-list additions to the program. Those of you who, like me, are used to operating controllers in a command-line fashion will probably find yourselves typing things like MH and C AA9FP. These just won't work, since anything you type goes out on the air. I wish that AEA had included a command-line window where direct controller commands could be typed—sometimes command line is just easier.

The initialization process will be familiar to those who are current Pakratt users. A small box shows each parameter's name as it is set. The time required for the process can be greatly reduced by checking the Fast Initialization box in the TNC Configuration dialog.

Controller commands are all sent through the combo boxes and buttons at the top of the window and, to be honest, I would much rather have just these, rather than only a command line. On the left-most side of the control bar is a combo box to select operating mode. Pressing the down arrow on this box drops down a list of all operating modes available for the controller/port that is active. Choosing one instructs PPWIN to set the controller for operation in the selected mode, including the modem and shift required. Just to the right of the mode box is another combo box which selects data rate. This works the same way and displays the available rates for your hardware.

> ***"One of the nicest things about PPWIN is the push-buttons that give you immediate access to your controller's functions."***

A set of push-buttons and a small box directly adjacent to the mode and data rate controls provides a way to select the virtual channel to be monitored. It is possible to select all channels or any particular channel.

Directly below these three controls are the status line and time/date. The status line displays messages appropriate to the operating mode—with information like unack'ed and received frames, and the state of the link. The date and time are displayed just below the status. The time appears in UTC (Coordinated Universal Time, also known as GMT—Greenwich Mean Time) to the left, and local 24-hour format time to the right of the date. Two small buttons allow you to select the desired version of the time, whose color switches to red when chosen.

### Push-Button Operation

One of the nicest things about PPWIN is the push-buttons that give you immediate access to your controller's functions. Some buttons do something immediate, like the one that turns on the maildrop—AEA's term for mailbox—and the CONPERM button that makes the current connection permanent until you turn it off. Most other buttons produce dialog boxes that give you an easy way to do things that otherwise would require multiple command lines or tedious linear input.

### Connect

The Connect button produces a dialog with an editable field, a list box, and six but-


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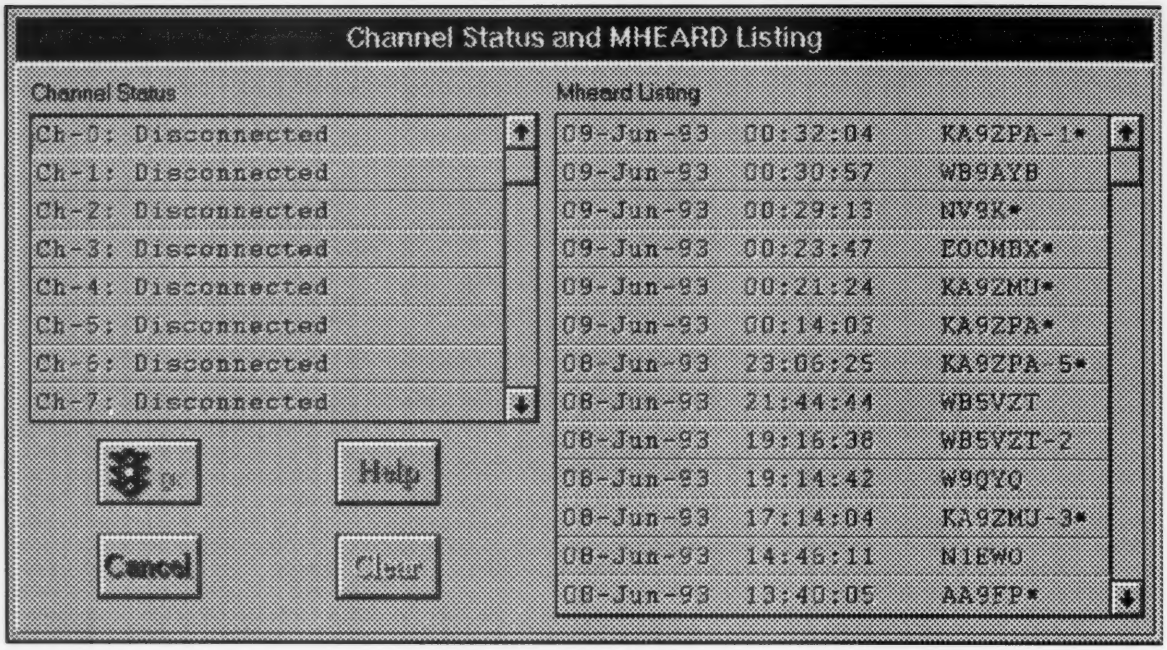


*Figure 2. MHEARD dialog box.*

tons. The field at the top of the box is where the desired connection gets specified. This can include digipeaters, and the line is specified in the traditional fashion:

N1EWO V AA9FP, EOC, BED (for example)

This is just as a command line would work, but with PPWIN you need only type the connect string once. At that point you can press the Add button, which will add the string to the list box, from which you can select the connection in the future. A companion Delete button allows removal of any strings from the list. The dialog also includes a Disconnect button, should you want to close an existing connection or one in the process of being made. The other three buttons include the usual Close, OK, and Help buttons.

The Help button, as the Help menu option and any other help button in another dialog, launches the standard Windows online help system containing the entire manual for PPWIN, as well as a complete listing of AEA controller settings. This is a great feature! Pressing a help button in any dialog produces instant context-sensitive advice—no scrounging through manual pages. As is usual with Windows help, you can search the text for keywords allowing quick and easy access to the information—this feature alone would have value as a separate product.

A companion Disconnect button is located just below the connect button on the main button bar for easy access.

**File Transfer**

The File Transfer button features a file folder with "XFER" on its side—pretty easy to locate. This button makes moving files between stations a snap, and not just text but binary (program, data, etc.) files, too. Pressing the button produces a dialog box with several buttons and a list box. A nice feature of PPWIN's file transfer capability is background operation. It is possible to start a file transfer—ASCII or binary—and switch to a different virtual channel to carry on a conversation. This is very convenient, given the relative slow transfer rate of most packet operations.

As with the Connect dialog box, PPWIN maintains a list of file names which can be added to, deleted from, or selected from the list box. Radio buttons—mutually exclusive push-buttons—select send or receive binary, or ASCII transfer modes.

**Capture**

Text capture, too, is just a button press away—indicated by a right-pointing arrow aimed at a floppy disk. This button produces a simple dialog box with a place to type in a file name (the default name is specified in the configuration menu), a Find button which allows browsing for a specific file, and a pair of radio buttons that select overwrite or append modes.

**Printing**

A Print button turns on and off capture to the printer. As with all Windows applications, printer setup is on the File menu.

**MHEARD List**

A button sporting a small ear produces the Channel Status and MHEARD Listing dialog box. This list serves two purposes. First, it shows recently heard stations—just as you'd expect. The surprise is that each entry on the list forms a push-button; pushing it—plus OK or Enter—will automatically connect you to that station. This is a great feature—no more scribbling down the info so you can try to connect to a new station that shows up on the list.

This dialog also shows a list of all virtual packet channels, and whether they are currently connected. As with the MHEARD list, selecting a channel from the list allows you to switch directly to that channel.

**Maildrop**

The Maildrop button makes maintenance easy. Pressing the button, marked with an addressed envelope, invokes the maildrop dialog. This dialog offers a list of incoming messages at the top—a double click will read the message into a pane just below where it can be scrolled using standard Windows scroll controls. Once the message is read, push-buttons offer several options:

Save Message—An editable field specifies the file name, a press of the Save Msg button writes the current message to that file.

Kill Message—The Kill button deletes the message from the Maildrop, just like typing kill {message number} at the command line.

Edit Message—This button invokes a small dialog which allows the editing of various message parameters and status. Three edit boxes offer the From, To, and BBS addresses for editing. Six radio buttons set Private, Traffic, and Bulletin status—as well as Reverse Forward, Read, and Not Read.

A dialog built into the bottom of the Maildrop dialog allows the composition of a message. Fields for Subject and Callsign

specify message parameters. The text is typed into a pane below and edited, or a filename can be specified or browsed as the message.

**Macros**

PPWIN has so many useful features that I find myself wanting to say, "This is a great feature!" over and over. So, at the risk of repetition—this *is* a great feature. Macros are used by PPWIN in two basic ways. First, there are standard macros for various operating modes. In AMTOR, for example, there is a CQ-AMTOR macro which you edit to contain your personal CQ text. The other type of macro is one you can choose from a listbox by pressing the Macro button from the main bar.

This dialog lets you create your own macros, which can be used to send special text and to control some controller functions. This is not the intention of the macros, unfortunately. To accomplish this, the function that you are interested in must have a keyboard shortcut and you must use a separate editor to get that shortcut as text. As an example, CTRL+F, in AMTOR mode, stops transmitting and sends a Morse ID. To include this in a macro, several steps are required:

1. Launch Windows Write—the Microsoft-supplied word processor. PPWIN actually makes this easy: It appears on the Tools menu of the main menu bar.

2. While holding the ALT key down, type 06 on the numeric keypad—not the number row of the main keyboard. Then release ALT. CTRL+F has an ASCII value of 6; Windows needs the leading 0. A box will appear in the Write window. This is a place holder for an unprintable character.

3. Using the mouse, carefully select just the box. Using the copy option from Write's Edit menu, transfer the character to the Clipboard.

***"Another thing that PPWIN does to make a ham's life easier is provide a way to easily set all those parms that make or break your station."***

4. Return to PPWIN's macro edit Window and Paste the copied CTRL+F in—the SHIFT+INSERT key combo will do this.

You now have a CTRL+F in your macro. While this works, it's no fun. The next version of PPWIN needs improvements to the macro capabilities.

**All Those Pesky Parameters**

On the main menu bar, the Parameters menu offers a way to set parms for each operating mode separately. Each choice provides a dialog with each parm available. Depending upon the nature of the parameter, it can be changed with a push-button, a drop down list, or an editable field—and they are all right there in front of you. To top it off, help is just a button press away. This is not only a great way to set the parameters, but it's a great way to learn them, too.

**More and More . . .**

As much as I have written about this product, there is more to it. There is a lot of depth to PPWIN, which is really designed to make operations easier. It is not wart-free, but it is, in my opinion, the best way to do digital ham radio I have ever seen, especially when teamed up with a PK-900 or DSP-2232 and their state-of-the-art capabilities. PPWIN will not be everything to everybody, but I can say that I feel a little sorry for those of you who don't own AEA hardware, since you need it to run this great program. If you own a Windows-capable computer and an AEA TNC or controller you have to own PPWIN!

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**73 Review**

*by Larry R. Antonuk WB9RRT*

# The STARTEK ATH-15 Portable Frequency Counter

STARTEK International, Inc.
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One of the fringe benefits of becoming a ham is watching the evolution of modern electronic technology. We hams have a front-row seat at the electronic stage—and sometimes we even get to perform. For example, it wasn't too long ago that a 2m handheld with frequency switches instead of crystals was a big deal. Nowadays, if you don't have dual bands, 97 memories, full-duplex, an alarm clock, and musical access tones, you're just not up to speed! In any product, if you look closely enough, there is always a spot in time where the engineers obviously accomplished the main goal, and then were able to concentrate on adding "frosting" for making the user more comfortable. Once the product has reached the point of fastest/smallest/most powerful/most sensitive, it starts to get more "humane." These features may take the form of memories or scan functions in our handheld, or more intuitive controls or menus. The radio doesn't really transmit any better than that old rock-bound rig, but it starts to make life easier—which is really the main job of any piece of technology.

This whole concept of "user-friendliness" is more often seen in consumer items—ham rigs, computers, cellular phones—than in electronic test equipment. This is mainly due to the number of units sold, the profit made, and consequently the dollars pumped back into R & D. In light of this, it's impressive to see a low-cost piece of test equipment that has made the jump over to "user friendly."

### It's User Friendly

The STARTEK ATH-15 Pocket Sized Frequency Counter comes from a long line of counters that, over the years, have been getting smaller, and faster, and able to read higher and higher frequencies. The engineers at STARTEK obviously found themselves at the same point as their consumer electronics counterparts. The last model out was certainly small enough—any smaller and you'd have to strap it to your wrist. It counted every frequency that most hams were interested in. There was a full line of accessories. The only other improvements could be in the category of "you know, it would be kinda nice if it did . . . " The STARTEK engineers took this assignment seriously and came up with two new features that make the ATH-15 not just easy, but actually enjoyable to use.

The first feature actually has nothing to do with frequency counters. It's an LED bar graph signal strength meter. This 10-segment graph sits near the top of the display, and simply indicates relative field strength. By itself, this is a useful item for antenna testing, foxhunting, or checking for RF leaks around your operating console. Used in conjunction with the counter, it provides an easy way to get a handle on maximizing the input to the counter when using low power sources. Rather than waiting for several counts until things stabilize and hoping for a good reading, you can simply peak the LED bar graph and know that your signal is at max—or relocate the counter or RF source until it is. This combined feature is very useful when playing with flea power transmitters, or snooping on a weak signal. (It should be noted that even though the counter and field strength meter can be used at the same time, they are electrically two separate devices. Some products on the market use a signal derived from the counter's circuitry for a strength indication. This works, but the signal strength readings can be dependent on the gate time of the counter, and whether or not it's in the HOLD mode. The ATH-15 keeps these functions separate, providing a true real-time field strength meter—at no extra cost.)

The second feature is actually several features, but they all culminate in the Automatic Trigger and Hold circuitry. This feature is extremely impressive, especially considering the price tag on the unit. Put simply, the readout will hold and display the last properly received frequency. In other words, keying your portable for a second on channel one will cause that frequency to stay on the display. Flip to channel two and tap the PTT. The display will flip to channel two's frequency—and stay there. This is a great

*Photo A. The STARTEK ATH-15 Portable Frequency Counter.*

function for testing or checking out multi-frequency radios, or counting and storing an interfering frequency. (If the optional "One-Shot Trigger" and "Hold" options are purchased, the ATH-15 will display and lock onto the first readable signal, ignoring any that follow.)

Just as important as the Automatic Trigger and Hold capabilities are the functions that make it possible. The first of these is an amazingly quick count time. The specs say that the unit can read an input signal, display the frequency, and switch to HOLD status in less than 80 milliseconds. In reality, 80 milliseconds seems like the point somewhere between where you decide to push the PTT and where you feel any pressure at all. (Plan on spending the first five minutes with your new counter running around the house, keying up everything in site. When I showed off the review unit to friends and technicians, the common term to describe the response time was "Wow.")

The other feature of importance is the "Automatic Clean Dropout" function. This keeps an eye on the current frequency and compares it to the last count. If the current count is of a shorter duration, the unit hangs on to the last good count without updating the display. This means that the "held" frequency will probably be correct—no "garbage" counts are displayed from when the transmitter was dekeying.

The ATH-15 is a sensitive unit. Most handhelds could be detected out to about 100 feet with no problem, using the standard antenna. The problem with this sensitivity is that the unit is easily overloaded in strong multiple RF fields. This is due to a combination of the unit's 1 to 1500 MHz bandwidth, plus it's high sensitivity. Unlike a radio with a tuned front-end, the ATH-15 can be listening to several signals in addition to the one you want to count. In other words, if you want to copy a weak 146 MHz signal at the same time the ATH-15 is hearing a garbage truck on 30 MHz, the police on 155 MHz, a construction company at 450 MHz, and a cellular phone at 850 MHz—well, things can get confusing. This "swamping" is the nature of any broadband device, as any ham who's had his HT at a flea market can tell you. The STARTEK engineers have created a solution to this in the form of a set of three different bandpass filters. These half-inch diameter filters come with BNC connectors, and pop in-line with the external antenna. They filter out the undesired frequencies, while passing the band you might be interested in. The filters are available in 60 MHz low-pass, 400 MHz high-pass, and 800 MHz high-pass configurations. They greatly increase the "effective sensitivity" of the unit, and would be helpful if you tend to do off-the-air monitoring of specific channels or bands. For most general purpose applications the filters won't be needed.

Operation of the ATH-15 is similar to earlier members of the STARTEK family. The "Count" switch controls the speed at which the samples are taken. As normal, a slower count time gives you a higher resolution display (five decimal places when counting a 1 to 500 MHz signal in the "Slow" position). The unit has a manual hold switch for locking in a reading, and of course the Automatic Trigger and Hold function can be turned on or off. If the "One Shot" option is purchased, switches on top control the resetting and operation of this mode. Like other models, this unit has two band positions: 1 to 500 MHz, and 500 to 1500 MHz. New features include a low battery indicator and extra bright LED digits.

In addition to the basic unit, STARTEK offers a complete line of accessories including antennas, cases, a high-stability oscillator option, and the bandpass filters. (Due to its size, the ATH-15 will tend to spend a lot of time in the toolbox or on the dashboard. The optional case is highly recommended.) At press time, the ATH-15 was being offered at a promotional price of $199, and a new model, the ATH-30 (2.8 MHz capability), was introduced at $259. They come standard with the one-shot feature. Prices include NiCds and a charger, and a one-year labor, five-year parts warranty. Your requirements concerning range and options might vary, but any of the STARTEK counters represent a great value for your test equipment dollar.


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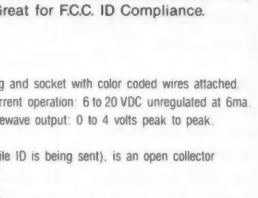

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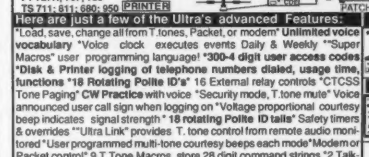


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Number 8 on your Feedback card

*by Jeffrey Sloman N1EWO*

# The AEA PK-900

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Price Class: $569

The dual-port PK-900 represents the next evolutionary step in AEA's multimode controller technology. Unlike the revolutionary DSP-2232, the PK-900 uses traditional modem technology with a few high-tech twists. The PK-900 offers improved ease of use and some changes in the computer-controlled portions of the unit's circuitry.

### LCD City

Unlike previous models—even the top-of-the-line DSP-2232—the PK-900 sports a sexy new LCD annuciator panel in place of the traditional LED Christmas light display. This high-contrast, backlit panel is easy to read under most lighting conditions, (with the exception of some occasional glare from reflected light.) One thing that makes this new display particularly useful is that, unlike the LED arrays of previous models, these indicators say just what they mean. The operating mode of either port can be seen from across the room—no more memorizing LED locations or guessing. The display provides a lot of information: operating mode, link state, TX and DCD indicators, various status indicators and, at the bottom of the display, a tuning meter.

Those of you interested in HF modes have, no doubt, spent a lot of time in front of your controller's tuning meter trying to get those LEDs to look just like the picture in the manual. I have, too. To be honest, my first reaction to the new LCD version was not good. It is quite different to use than the LEDs I had come to know. But after I had used the 900 for a while I found the LCD just took some getting used to. It is at least as good, if not better than, its predecessor. At the very least, it is physically wider, making it easier to see.

Note that the 900 display has only fixed annuciators, it does not have the ability to display arbitrary text messages like its DSP-2232 big brother. While this would be very nice to have, it really does detract from the 900's utility.

Also located on the front panel are the traditional threshold control (a nice, big, easy-to-use knob) and the power switch. This knob adjusts the sensitivity of the DCD (Data Carrier Detect) function, and is only functional for port 1. Moving the power to the front is a nice change from the PK-232, the 900's predecessor.

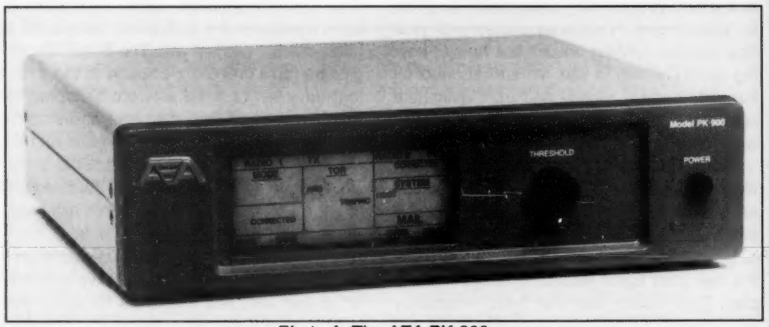


*Photo A. The AEA PK-900.*

### The Back Panel

The back panel of the unit is a pleasant blend of the old and new. The 900 uses the same coaxial power connector as previous models, making upgrading a little easier. A five-pin DIN connector provides output for a tuning scope, and for direct CW keying.

This connector replaces the old RCA jacks for keying, although I'm not sure this is an improvement. The RCA approach was very easy to use.

The two radio ports depart from the PK-232 and more closely resemble the DSP-2232's five-pin DIN connectors. The 232's unusual radio connectors made building a cable somewhat difficult once the AEA-supplied units were exhausted. A pleasing throwback to the 232, however, is the inclusion of two 1/8-inch phone jacks on the rear for audio input. This is great for SWLs who will not transmit with the unit, and for those of you who are like me and just can't wait to see the unit do its stuff.

A fourth DIN connector provides FSK (Frequency Shift Keying) outputs for RTTY fans with radios capable of using them. Both positive and negative keying are available. Transmit level controls for each radio are screwdriver adjustments, also located on the back panel.

The connection from the PK-900 to a data terminal or computer is made through a DB-25 connector which supports pins 1 through 8 and 20. These are the standard pins needed for any sort of RS-232 serial connection. Next to this connector is the unit's reset button, which operates in conjunction with the power switch to reset the 900 to factory defaults.

Four additional trimmers located on the right side of the box allow screwdriver adjustment of the AFSK levels for each radio. The PK-232 had only one, pointing out that the 900 is a true two-port unit, not just able to switch between radios.

### What Can It Do?

The specifications of the PK-900 are impressive. The unit will operate in just about any mode that a modern ham could want:

AX.25 (Packet) HF and VHF
Baudot RTTY
ASCII
AMTOR
PACTOR
Morse (send/receive)
HF Wefax (Weather Fax) in Greyscale
NAVTEX reception
TDM (Time Division Multiplex) reception
Bit-inverted RTTY (encrypted) reception

The PK-900 accomplishes all these modes with some very nice hardware. AEA has always been known for superior HF performance, and the PK-900 incorporates the same eight-pole Chebychev bandpass filter used in the excellent PK-232 for high frequency operations. This filter means that the 900 should do much better than average with poor signal conditions, an assertion borne out by experience—not just mine; ask around. The 900 has it all over the PK-232 in the modem department, since soft selection of the modems let each mode's precise needs be accommodated.

On the output side, the unit uses a DDS chip (Direct Digital Synthesis) to modulate the radio making it extremely flexible. The PK-900 could produce any sort of modulation you might want, including DTMF or two-tone sequential paging, if the mood struck you. A user program capability makes this feature

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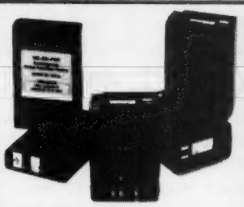

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| FNB-4A | 12v @ | 1000 MAH |
| *FNB-10(S) | 7.2v @ | 1000 MAH |
| FNB-12 | 12v @ | 500 MAH |
| FNB-12(S) | 12v @ | 600 MAH |
| FNB-17 | 7.2v @ | 600 MAH |
| equiv. to FNB-11 (1/2" shorter) | | |
| *Same size case as FNB-12 | | |
| *FNB-25 | 7.2v @ | 600 MAH |
| FNB-26 | 7.2v @ | 1000 MAH |
| *FNB-26A | 9.6v @ | 800 MAH |
| **FNB-26(S) | 7.2v @ | 1500 MAH |
| *Same size as FNB-26 case | | |
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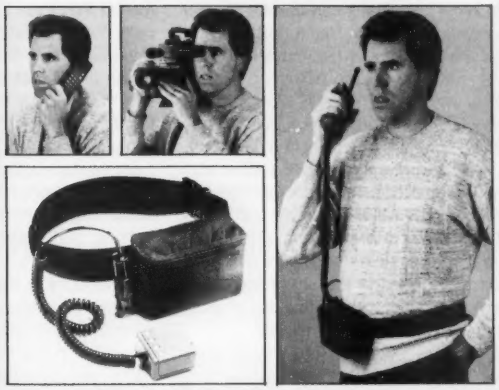

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available to the hackers among us.

With it's optional 9600 baud modem (about $75), the PK-900 is ready to keep up with the world of packet as it grows. By the time you read this, PACTOR will be a standard feature, no longer an option. Current owners without PACTOR should contact AEA concerning the upgrade.

### Dual Port

The big question I hear about the PK-900 concerns its dual-port capabilities. Hams want to know just what it can do with the two ports. Here's the scoop: Radio port one can do anything—any mode the controller is capable of. Port two, on the other hand, is restricted to packet—HF or VHF. This is full simultaneous operation. Unlike the PK-232 whose two ports were selectable by a switch, the PK-900 can keep your VHF packet station on the air while you work AMTOR, or PACTOR, or any other mode on port 1. To me, this is what dual-port ops should be. Keep in mind that AEA's engineers designed this box to be used in the shack, not as a node in a packet network. Its features and capabilities are targeted to that market.

### PACTOR

Yes, the PK-900 does PACTOR. This mode is a lot of fun, combining the qualities of packet and AMTOR for excellent weak-signal performance. The PK-900's inherently excellent HF performance is available in PACTOR mode, too. You will find plenty of PACTOR traffic on 10 and 20 meters. It sounds like an AMTOR station on barbiturates. This mode will probably eventually replace AMTOR, since it works better for most amateur operations.

### Using the 900

If you are familiar with AEA hardware, the PK-900 will not present any surprises. The unit's autobaud routine easily sets the data rate at initial startup, reducing a lot of difficulty for new users. The manual provides a thorough section on setup and connection of the unit. Once again I am forced to say that, while AEA's manuals contain lots of information, their organization affects ease of use a little more than I would like. (A diplomatic way of saying I don't care for the manual.) On the other hand it does include the most important information: connector pinouts, schematics, and a complete command summary.

In my opinion, there is only one way to use the PK-900: with AEA's new PC Pakratt for Windows. This program, which is reviewed elsewhere in this issue, makes using the PK-900 a real pleasure. Not only does PPWIN know about every bell and whistle, it also provides concurrent access to the two radio ports—a neat trick. If you can't run Windows, you should seriously consider buying a program that knows about the PK-900. There are DOS and Macintosh versions of Pakratt available from AEA, as well as third-party terminal programs that work with the unit. While the 900 can be operated from the command line, it is a complex piece of equipment and will have a very steep learning curve without the computerized assistance.

### Performance

What else can I say? The PK-900 performs *very* well. It is directly comparable to the PK-232. In fact, in side-by-side testing, the two units were indistinguishable. Both showed excellent HF performance—especially noted in poor conditions or with weak signals. VHF performance was stellar as well, but of course it had better be. If a TNC has trouble on VHF packet, something is wrong. If you want some opinions on PK-900 performance, you can ask some PK-232 owners what they think of their controllers—you're bound to find several on the local repeater.

### Conclusion

Teamed up with PC Pakratt for Windows and a pair of transceivers, the PK-900 is the heart of a truly state of the art digital ham station. The PK-900 costs a bit more than the PK-232, but the difference in cost is reflected in the capabilities of the box. If the additional outlay doesn't scare you off, you won't be disappointed with the PK-900.


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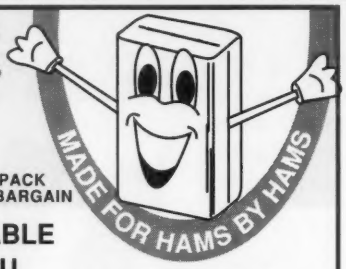


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| BP-85S 12V 800mah $76.00 | FNB-26 7.2V 1000mah $60.00 | |
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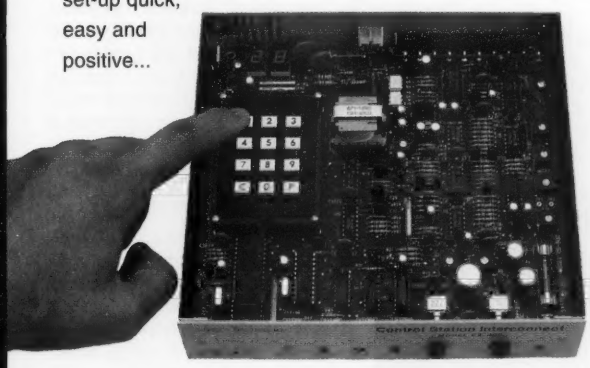

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**CIRCLE 12 ON READER SERVICE CARD**

# Julieboard

## An easy-to-build DDS synthesizer for the PC printer port.

by Bruce Hodgkinson VE3JIL

Every so often, a technology development comes along which radically and permanently alters the landscape of amateur radio—spark to CW, AM to SSB, vacuum tubes to solid-state, and so forth. Each of these new developments has made possible things which could only be dreamed of before, but quickly become taken for granted. The introduction of direct digital synthesis (DDS), a DSP-related technique, has been one such advance in the RF design field. At first, DDS-based gear could be afforded only by the military, but the state of the art has now advanced to the point where new commercial and amateur radio designs include it as a standard feature.

### Why DDS?

The best way to answer that question would be to take a look at the disadvantages inherent in the old techniques. Traditionally, VFOs (including those based on phase-locked loops) have employed analog LC oscillators dependent on mechanical and physical characteristics for frequency control. Although analog oscillators are appealing due to their apparent simplicity, they fall prey to the usual analog type bugaboos: calibration error, drift, phase noise, excessive lock-up time, etc. This means that designs which use analog frequency control can—and usually do—lead to alignment, debugging and calibration hassles which then require expensive equipment and time to fix. For those working with phase-lock loops, there is the additional problem of making the frequency resolution vs. lockup time vs. capture/lock range tradeoffs, which invariably compromise performance and/or force the designer to go to multiple loops, mixers, filters, etc.

With DDS, on the other hand, a few chips on a board slightly larger than a business card can implement a wide-band oscillator which gives:

- 0 to 16 MHz coverage
- 0.007 Hz frequency resolution
- Virtually instantaneous switching time
- No drift/no calibration
- Excellent spectral quality
- Simple interface via PC printer port

So, I designed one. This board (which I've named the "Julieboard") is easy to build and is intended for use as a building block to add digital tuning capability to home-brew equipment.

### Why the PC Parallel Port?

The first part of this question really asks, "Why the PC?" The DOS computer has made its way to a very high number of amateur stations, doing such jobs as log-keeping, packet radio, word processing, satellite tracking, et cetera. The price has come down to the point where (occasionally) first-generation PCs are actually available free for the taking if one is at the right place at the right time! The software required to drive this oscillator is so simple that it will run on any DOS machine, right down to the humblest one-floppy system, which means that if a PC actually has to be acquired for the specific purpose of running this oscillator, it needn't cost more than a nominal amount.

The second reason for using the PC is that it is a fine platform from which to develop and implement control functions via software: The "front panel" can take any form the user wants, changes can be made at will without having to modify or junk hardware, and functions can be easily done which would be difficult, if not impossible, to do with dedicated hardware. Rather than being stuck with one hard-wired approach, the user has a software "playground" in which his only limitations are imagination and time available for programming.

Finally, code can be written, modified, and debugged on the same machine on which it runs—allowing the use of widely available and reasonably priced development tools.

The second part of this question is, "Why the parallel port?" Why not do a plug-in (slot resident) version? The first answer is that not all PCs (lap-tops, for example) have plug-in slots available for another board. Also, many PC owners, especially those without a technical background, are not really keen on tearing apart a working system just to install another board which then has to be configured and set up on a particular address location. This is a real problem if the PC belongs to somebody else or the oscillator has to be moved often.

The parallel printer port offers a "plug and play" alternative: Almost every PC has a printer port and few indeed are those computer users who aren't capable of guiding a DB-25 connector onto the end of a cable. Also, a plug-in board approach forces the user to install the oscillator inside the PC itself—which can cause noise problems, as well as impose limitations on where the equipment can go. With the parallel port approach, the equipment can be located a long distance away from the PC and driven via a long extension/ribbon cable for remote operation. Finally, the parallel port, being non-bus-specific, can be replicated with any simple TTL six-bit register. For example, there is no reason why an appropriately programmed single chip microcomputer (such as a Motorola '68705 or Intel '8051) couldn't replace the PC for those who really object to having to drag around a large, bulky PC just to drive a tiny little board. With a single chip microcomputer, an entire HF rig could be made to fit into a shirt-pocket-sized package!

*Photo A. Julie and her board.*

### Circuit Description

The circuitry for the Julieboard fits on a small two-layer printed circuit board about 2.5" x 4.5". On one end is the DB-25 connector for the printer cable and the other end has the BNC output and power/external-clock connectors. Power input needs are not critical—anywhere from about +7 VDC to +12 VDC will do. The input is polarity-protected so if the polar-

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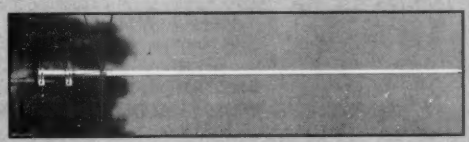

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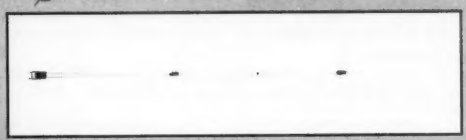

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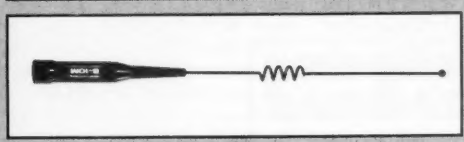
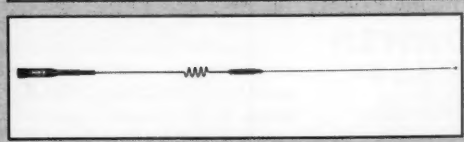
**Length:** 3' 4"
**Connector:** PL-259

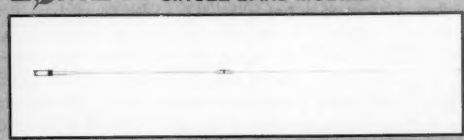


**B-10/B-10NMO**
Dual-Band 146/446MHz
**Gain & Wave:**
146MHz -dB 1/4 wave
446MHz 2.15dB 1/2 wave
**Max Power:** 50 watts
**Length:** 12"
**Connector:** PL-259 or NMO Style



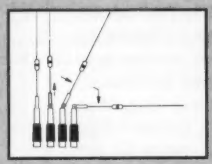
**B-20/B-20NMO**
Dual-Band 146/446MHz
**Gain & Wave:**
146MHz 2.15dB 1/2 wave
446MHz 5.0dB 5/8 wave x 2
**Max Power:** 50 watts
**Length:** 30"
**Connector:** PL-259 or NMO Style

## COMET™ SINGLE-BAND MOBILE



**CHL-185**
2 Meter Mobile Antenna
**Gain & Wave:**
4.1dB 5/8 wave
**Max Power:** 200 watts
**Length:** 4' 8"
**Connector:** PL-259

**CH-32**
Miracle Baby 146/446MHz HT
**Gain & Wave:** 0dB
**Max Power:** 10 watts
**Length:** 1.75"
**Connector:** BNC



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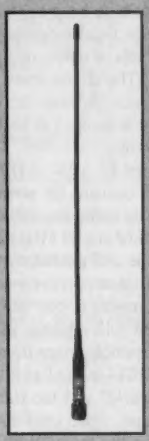

**SH-55**
2M/440MHz
SUPER Flexible
HT Antenna
**Gain & Wave:**
146MHz 1.5dBi 1/4 wave
440MHz 3.2dBi 5/8 wave
**Max Power:** 10 watts
**Length:** 15"
**Connector:** BNC

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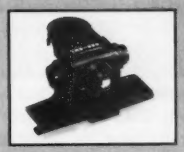

**RS-820**
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ity is wrong, no damage will be done—it just won't work. The incoming DC voltage is regulated down to the +5V level required to run the on-board logic. The only restriction regarding input voltage is to keep it high enough to overcome voltage regulator dropout and low enough to keep regulator power dissipation at a reasonable level. (This circuit draws about 200 mA and the difference between the input voltage and +5V output is dumped as heat at about 200 mW per excess volt).

The largest IC, a 28-pin DIP package (a Harris HSP45102) contains the actual DDS synthesizer logic right up to the sine PROM-output. This device is clocked at a 40 MHz rate by a clock oscillator module and produces a new 12-bit binary word at its output pins every clock cycle. The frequency increment is determined by a pair of internal 32-bit shift registers which are loaded via TTL bit-sequences driven from the parallel port.

The 74HC14 is used as a buffer between the "outside world" and the Harris DDS chip—it provides input signal conditioning and serves as a buffer for the more expensive DDS device. Likewise, the 74F132 performs a conditioning and buffering function between on-board logic and the outside world. It performs an automatic line select function for the external clock: If an external clock signal is applied, the board logic automatically selects that signal, saving the user from having to configure any jumpers.

The output of the Harris DDS chip represents a 12-bit binary sample of the desired waveform at the time of each clock tick; before it can be of much use, this binary output must be converted into an analog voltage. The Harris CA3338 video digital-to-analog converter (a 16-pin DIP package) converts the digital outputs into corresponding analog levels at the 40 million samples per second rate. This level of performance was unheard of several years ago and was one of the reasons why DDS systems were so expensive when they first came out. Things have changed.

The output from the DAC looks like a sine wave made up of little tiny "steps"—256 different levels, to be exact. (One small compromise in this design was made by using an eight-bit DAC rather than a 12-bit DAC, but the four "wasted" binary outputs have such a small impact on the output that the savings in cost easily justified the change. With the 12-bit DAC, the sine wave would be made up of 4,096 different levels of steps.)

"Wait a minute," one might say, "That's noise—I don't want THAT on my transmitter output." Without getting too deeply into sampling theory, let me say that "that noise," is almost completely insignificant. Look at the "made-out-of-little-steps" sine wave again. Think of this as an absolutely perfect sine wave with a superimposed noise consisting of those steps. See how small and how much higher in frequency (than the sine wave) is that noise waveform? It is no problem to filter the noise out—done by the low-pass filter module located on the board.

The filter module implements a seventh order elliptic low-pass filter in a 10-pin SIP package. The space taken by a discrete version of this filter could easily take up half again as much room as the remainder of the circuitry. Since this design is a "building block," why not make it as small as possible?

```
10 CLS:LOCATE 1,1:PRINT                  ' Bruce Hodgkinson  VE3JIL
20 PRINT"  JulieBoard 200 Controller:  JUL200.BAS   Apr. 19/93
30 PRINT
40 PRINT"  Options are:       'F' for new frequency
50 PRINT"                     'Q' to quit"
60 PRINT"                     '<' to increment by 100Hz
70 PRINT"                     '>' to decrement by 100Hz
80 PRINT
90 PRINT"                    Frequency (KHz) = "
100 GOSUB 220
110 A$ = INKEY$:IF LEN(A$) = 0 THEN 110
120 IF ASC(A$) = 46 THEN GOSUB 310       'decrement for "." key
130 IF ASC(A$) = 62 THEN GOSUB 310       'decrement for ">" key
140 IF ASC(A$) = 44 THEN GOSUB 330       'increment for "," key
150 IF ASC(A$) = 60 THEN GOSUB 330       'increment for "<" key
160 IF ASC(A$) = 102 THEN GOSUB 220      'new F for "f" key
170 IF ASC(A$) = 70 THEN GOSUB 220       'new F for "F" key
180 IF ASC(A$) = 113 THEN 500            'quit if q
190 IF ASC(A$) = 81 THEN 500             'quit if Q
200 GOTO 110
210 '
220 LOCATE 15,1:PRINT "New Frequency (KHz)"          ' new F
230 LOCATE 15,21:INPUT NF
240 LOCATE 15,1:PRINT "                                "
250 IF NF >16000 THEN 220
260 IF NF <0 THEN 220
270 LOCATE 9,39:PRINT "                "
280 LOCATE 9,39:PRINT NF:N=NF*1000
290 GOSUB 370:RETURN
300 '
310 N = N - 100:IF N<0 THEN N = 0                    ' decr 100Hz
320 GOTO 340
330 N = N + 100:IF N>16000000# THEN N = 16000000#    ' incr 100Hz
340 LOCATE 9,39:PRINT "                "
350 LOCATE 9,39:PRINT N/1000:GOSUB 370:RETURN
360 '
370 'NX = INT(N* 134.217744#): OUT 888,127             phase incr 32MHz
380 NX = INT(N* 107.374195#): OUT 888,127            ' phase incr 40MHz
390 FOR K = 31 TO 0 STEP -1
400 KX = INT(NX/(2^K)):NX = NX - (KX * 2^K)          ' bit by bit
410 IF KX = 1 THEN 430
420 GOSUB 490:GOTO 440
430 GOSUB 480                                        ' shift bit into DDS
440 NEXT K
450 FOR K = 1 TO 32:OUT 888,223:OUT 888,207:NEXT
460 OUT 888,127:RETURN
470 '
480 OUT 888,222:OUT 888,206:RETURN                   ' shift "1" into DDS
490 OUT 888,223:OUT 888,207:RETURN                   ' shift "0" into DDS
500 END
```

*Figure 1. Simple controller routine written in GWBASIC.*

**Driver Software**

One of the nice things about using the PC to drive this unit is that a wealth of software development tools are available. The first thing that comes to mind probably would be GWBASIC or some other BASIC interpreter. GWBASIC was used to get the proto-type up and running and a listing of a simple controller routine is shown in Figure 1.

To operate the board, the driver program must drive six DDS control lines:

| | |
|---|---|
| SDATA* | (shift data) |
| SCLOCK* | (shift clock) |
| XFER | (new value transfer) |
| ENPHACC | (enable phase accumulator) |
| SHIFTEN | (shift enable) |
| BANKSEL* | (BANK select) |

In normal operation, the software holds all four lines HIGH—enabling ENPHACC (allowing the oscillator to run) and disabling/idling the other three (SDATA*, SCLK*, and SHIFTEN). The choice of "HIGH" as the normal state is no accident: This allows the output frequency to be set from the computer, then disconnected from the PC without losing the programming. This means that the printer port does not have to be tied up permanently—it can still be used to drive the printer while the synthesizer is still in operation by means of a printer switch!

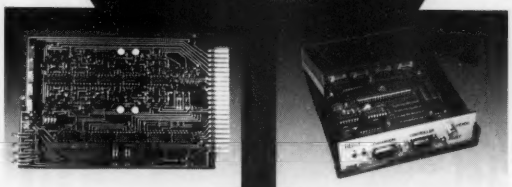
To load a new frequency, the program disables XFER by driving it LOW, enables SHIFTEN by driving it LOW, then shifts in new data by clocking in 64 bits of updated frequency information via the SDATA* and SCLK* lines. Each data bit must be inverted (SDATA* = "0" to shift a "1" into the DDS) and is clocked-in with each HIGH-to-LOW transition on the SCLK* line. The new frequency pair is transferred into the DDS once software re-enables the XFER line by driving it HIGH again. (If this line is allowed to stay active throughout the shift process, there would be 31 periods during which the output frequency would be set to a bogus value, possibly causing interference far off-band).

If desired, the oscillator can be disabled by setting ENPHACC LOW, though this is not critical.

Selection between the two banks is done via the printer port STB* line. This is an open-collector line, so it can be driven from external equipment or from the PC. The PC can read the status of this line, so it can respond to external events via software. For example, a pair of frequencies could be programmed: one frequency

*Continued on page 44*

# For Repeaters only.



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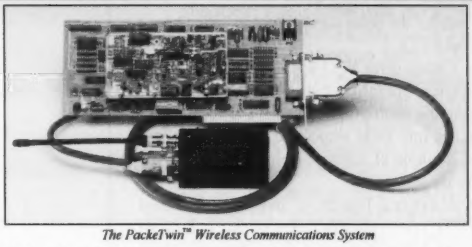

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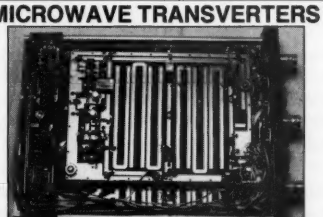

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**Julieboard**

*Continued from page 42*

for "mark," the other one for "space," then keyed to send RTTY.

In a transceiver VFO application, RIT or split frequency operation can be implemented by loading the appropriate transmit and receive frequencies into their respective banks. (This is a good example of software being used to replace hardware.)

If an external line drives this input, it should be a TTL open collector driver so that it does not cause or suffer damage if the computer should drive the line LOW. This "wired-OR" scheme (where if one source or the other or both drive LOW, the line gets dragged LOW) implements an internal drive/external drive scheme which requires no hardware configuration or setup.

**Constructing the Hardware**

The circuit is not difficult to duplicate and can easily be built with wire-wrap. Because high frequencies are involved, it must be built with the proper techniques or it will not work at all! If you are not familiar with high-speed logic, a commercially fabricated blank PCB or a wired-and-tested board (available from the author) is probably the safest approach.

A high quality circuit board with a low-inductance ground is an absolute must—my standard technique is to use prototype boards with the fat copper strips running up the IC center lines and bridge the strips crossways with a cross-grid built up out of solder-saturated SOLDER-WICK laid along the board. Don't even think of using one of those copperless "protoboards." Plan the layout ahead of time to leave room for the IC sockets and decoupling capacitors.

The IC sockets must be high quality machined gold contact types—the cheap leaf types are not suitable due their high profile (needless lead inductance) and poor reliability. I have often seen them fail, but I've never seen a gold machined contact fail yet. They are expensive (often costing more than the chips they hold), but they are cheap aggravation insurance.

Place the sockets in their final resting places and wire in their ground pins. These must be near zero in length and the widest practical width. My usual practice is to dedicate the bottom-side copper strip (running up the center of the IC pin-rows) to ground and solder the IC ground pins directly to that.

After all, the IC socket's ground pins have been hooked up and the decoupling capacitors have been installed. Decoupling capacitors MUST be placed at the power supply pins of the HSP45102 DDS chip (8,22), the CA3338 video-DAC (13,16), the clock module (14), and the 74F132 (14). The 74HC14 is not a high-speed part, but it should be decoupled also. Keep the leads of the decoupling caps short—the body of the capacitor should just about touch the power pin being decoupled! An eighth-inch lead length is too long. On the DDS chip, the IC designers conveniently placed a ground pin immediately adjacent to each power pin so that the decoupling caps can exactly bridge power/ground with zero lead length—this dictates the use of capacitors with 0.1" lead spacing. Use 0.1 µF as specified—don't try to "improve" the decoupling by

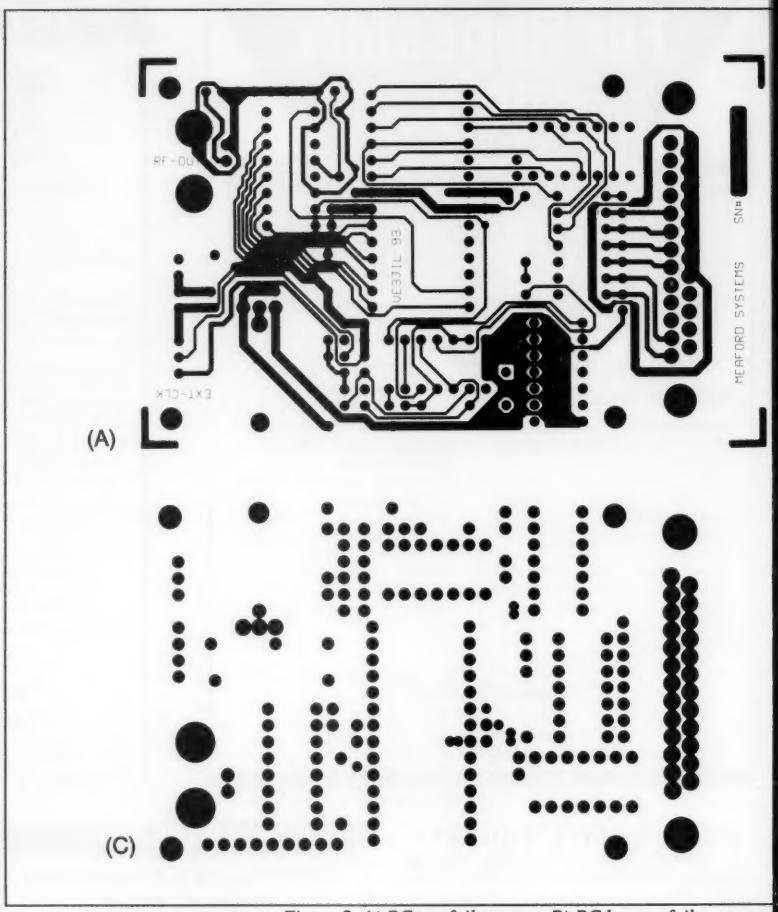



*Figure 2. A) PC top foil pattern; B) PC bottom foil pattern;*

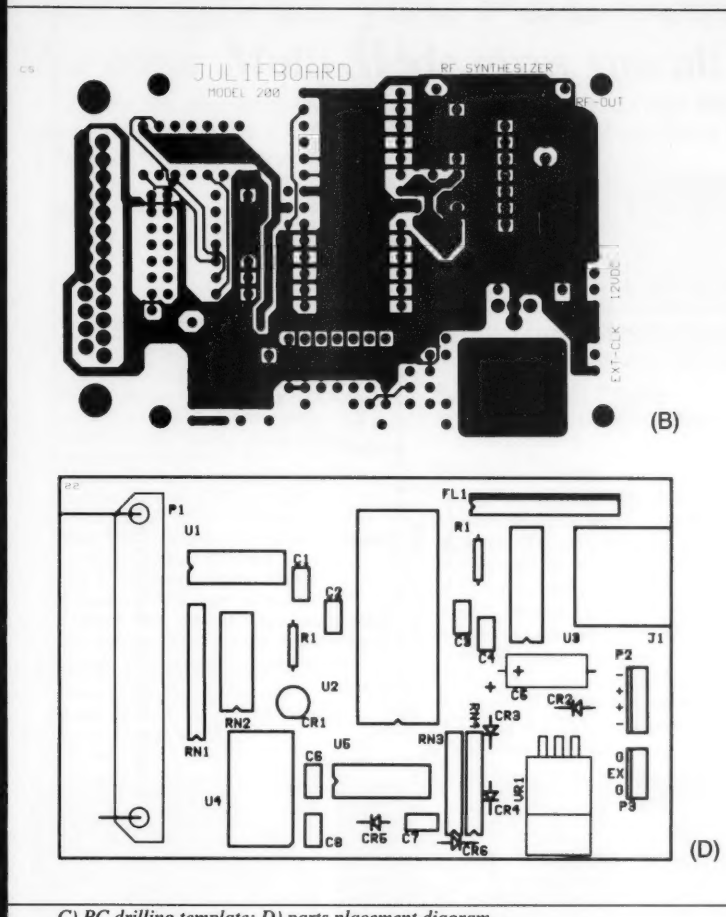
using higher values of capacitance: Higher capacitance values tend be more inductive and have a lower self-resonant frequency. Above its self-resonant frequency, a capacitor looks inductive and could make the situation worse than if it weren't there! Once the decoupling caps are installed, wire up the +5V bus to the sockets. At this point there should be virtually infinite DC resistance between the +5V and ground lines.

Next, install the 7805 regulator and its diodes. A heat sink with thermal compound on the regulator is a must, as it will dissipate about 1-1/2 watts with +12V input and can get hot to the touch. If you know for sure that the input voltage will always be +12V, a 22 ohm 2W series resistor can be placed in the power input line to help drop the voltage and decrease regulator dissipation. My usual rule of thumb: If I can't hold my finger on a heat-dissipating device, it's running too hot.

When building something, it is wise to take a "divide-and-conquer" approach by doing the project stage-by-stage and testing it after each round of construction. This is a good time to make the first test—better to fry one cheap regulator now than a board filled with expensive parts later! Apply power to the unpopulated board and confirm that the regulator output equals +5V and that +5V appears at all power supply pins and 0V shows up at all ground pins. Check resistances between the ground pins with an ohmmeter to confirm that all "ground" pins are indeed tied to ground. Now, install resistor networks RN1 and RN2 along with U1 and wire up all the signals involving these devices, right up to and including the DDS chip, U2. In the breadboard version, I wired up diagnostic LEDs to the outputs—a great aid for software development and for verifying that the right LPT port is being used to "talk" to the board. Power up the board and probe U2 pins 9, 10, 12, 13, 14, and 17—all of which should be a logic LOW. U2 pins 11 and 18 should be HIGH. Short the following DB-25 pins one by one to ground and look for these responses:

| | |
|---|---|
| DB25, pin 1 | U2, pin 9 goes HIGH |
| DB25, pin 2 | U2, pin 13 goes HIGH |
| DB25, pin 6 | U2, pin 14 goes HIGH |
| DB25, pin 7 | U2, pin 17 goes HIGH |
| DB25, pin 8 | U2, pin 12 goes HIGH |
| DB25, pin 9 | U2, pin 10 goes HIGH |

The next phase requires an HF receiver and a PC running the Julieboard driver software. Wire up the oscillator module and install U2. (Bear in mind that the DDS chip is specified as being ESD-sensitive by Harris and can be damaged or even destroyed by improper handling. If possible, handle this chip only at a properly equipped




*C) PC drilling template; D) parts placement diagram.*

ESD-protected workstation with wrist straps and an anti-static worktop.)

The 74F132 NAND gate U5 and its associated parts may be installed now.

Connect the PC to the Julieboard DB25 female connector via an appropriate cable (male DB25/male DB25 straight-through) and power up the board. Select a test frequency (this isn't critical, any frequency between 1 MHz and 16 MHz will do) and tune the receiver (CW or SSB mode) to that frequency. A clear continuous carrier should be audible fairly close to the expected frequency. (Use a short piece of wire in close proximity, but not touching, the board as the antenna for the receiver). Try tuning the signal in 100 Hz increments and listen for the corresponding changes in pitch. If it works . . . congratulations, you're almost there! If not, look for activity on U2 output pins 27-28 and 1-6: If they are completely dead, try verifying the presence of the 40 MHz TTL clock at U2 pin 16 and confirm proper U2 hookup. Check that:

| | |
|---|---|
| VCC | pin 22 = +5V |
| VCC | pin 8 = +5V |
| BANKSEL | pin 9 = LOW |
| ENPHACC | pin 12 = LOW |
| LOAD* | pin 18 = HIGH |
| GND | pin 7 = GND |
| GND | pin 15 = GND |
| GND | pin 21 = GND |

Try feeling the case of the DDS chip. If it is very hot, the problem likely involves the DDS chip itself; if it is stone cold, the problem could either be a faulty clock module or a dead DDS chip. A normally working DDS chip should be slightly warm—if this is the case, suspect a problem with the programming or control process. (Also check to see if it is getting +5V!).

Once DDS chip operation has been verified, wire and populate the CA3338 video DAC (U3) and the filter module (FL1) sockets, observing the same ESD precautions as for U2. The synthesizer output should look like a perfect sine wave, except for low frequencies which will show some "staircasing," courtesy of the D/A conversion process. Finally, verify the EXTERNAL CLOCK function with an external clock—if it works OK, then the construction of the synthesizer is complete. Have fun with the new toy!

## Conclusion

I have had computer-controlled DDS synthesizers in my shack for several years now and would almost rather give up my scope or multimeter than do without them—they were well worth the development cost. So far, they have been used for:

- •Frequency spotting
- •Software-controlled VFO
- •VFO for home-brew direct conversion receivers
- •Digital retro-fit to analog equipment
- •Remote tuning of transmitters/receivers
- •Frequency-hopping/spread spectrum work
- •Programmable secondary frequency standard
- •Crystal/crystal-filter characterization
- •Crystal oscillator substitution
- •ATE signal generator/sweeper

I found that direct conversion receiver circuits worked especially well with this oscillator—tuning via software on the computer screen was a real novelty and the sound was particularly crisp and clear. Perhaps the next challenge will be a home-brew digital transceiver!

## Personal Note

Why "Julieboard"? Well, back when I did my first DDS-for-a-PC design (this is my third), I needed a name for the project. At the time, my second-oldest daughter, Julie, was in her active toddler phase and the name seemed appropriate for a board originally intended for frequency hopping development work. Since I have three other daughters, I suppose I'll have to do at least three other boards so that Julie's sisters don't feel left out!

*Continued on page 46*

**Parts List**

| Quantity | Part | Description | Digikey # |
|---|---|---|---|
| 1 | U1 | 74HC14 | MM74HC14N |
| 1 | U2 | Harris HSP45102 | PC-40 |
| 1 | U3 | Harris CA3338AE | CA3338AE |
| 1 | U4 | 40.000 MHz osc. module | CTX120 |
| 1 | U5 | 74F132 (can sub 74F00) | (74F00PC) |
| 1 | VR1 | 7805 regulator (TO-220) | AN7805 |
| 1 | FL1 | Coilcraft filter module | K9686-5 |
| 1 | CR1 | Green light emitting diode | P309 |
| 2 | CR2,CR6 | 1N4001 diode | 1N4001GI |
| 3 | CR3-5 | 1N914 diode | 1N914APH |
| 1 | R1 | 1K5 5% 1/4W resistor | 1.5KQ |
| 1 | R2 | 75R 5% 1/4W resistor | 75Q |
| 1 | RN1 | 47k resistor network (8sip7) | Q7473 |
| 1 | RN2 | 100R resistor network (14dip7) | 760-3-R100 |
| 1 | RN3 | 1K5 resistor network (8sip4) | Q4152 |
| 1 | RN4 | 100R resistor network (8sip4) | Q4101 |
| 7 | C1-4,C6-8 | 100N ceramic cap (.1" L.S.) | P4917 |

| Quantity | Part | Description | Digikey # |
|---|---|---|---|
| 1 | C5 | 1U0 aluminum electrolytic cap | P1345 |
| 1 | J1 | Right angle BNC connector | Mouser #177-3138 |
| 1 | P1 | Female DB25 right-angle connector | 425F-ND |
| 1 | P2 | 4x1 male header | WM4202 |
| 1 | P3 | 3x1 male header | WM4201 |
| 1 | | Blank printed circuit board | |
| 1 | | heat sink | #HS106-ND |
| 1 | | thermal compound | |
| 1 | | male/male DB25 cable | C7MMT-251OG-ND |

Note: J1 is AMP # 228686-1
P1 is AMP # 745353-4

Optional:

| Quantity | Part | Description | Digikey # |
|---|---|---|---|
| 1 | U2 | 28p machined (gold) IC socket | AE7228 |
| 1 | U3 | 16p machined (gold) IC socket | AE7216 |
| 3 | U1,U4-5 | 14p machined (gold) IC socket | AE7214 |

Blank printed circuit boards, partial kits, and finished units are available from the author (Box 232, Pakenham, Ontario, CANADA K0A 2X0; (613) 624-5247).

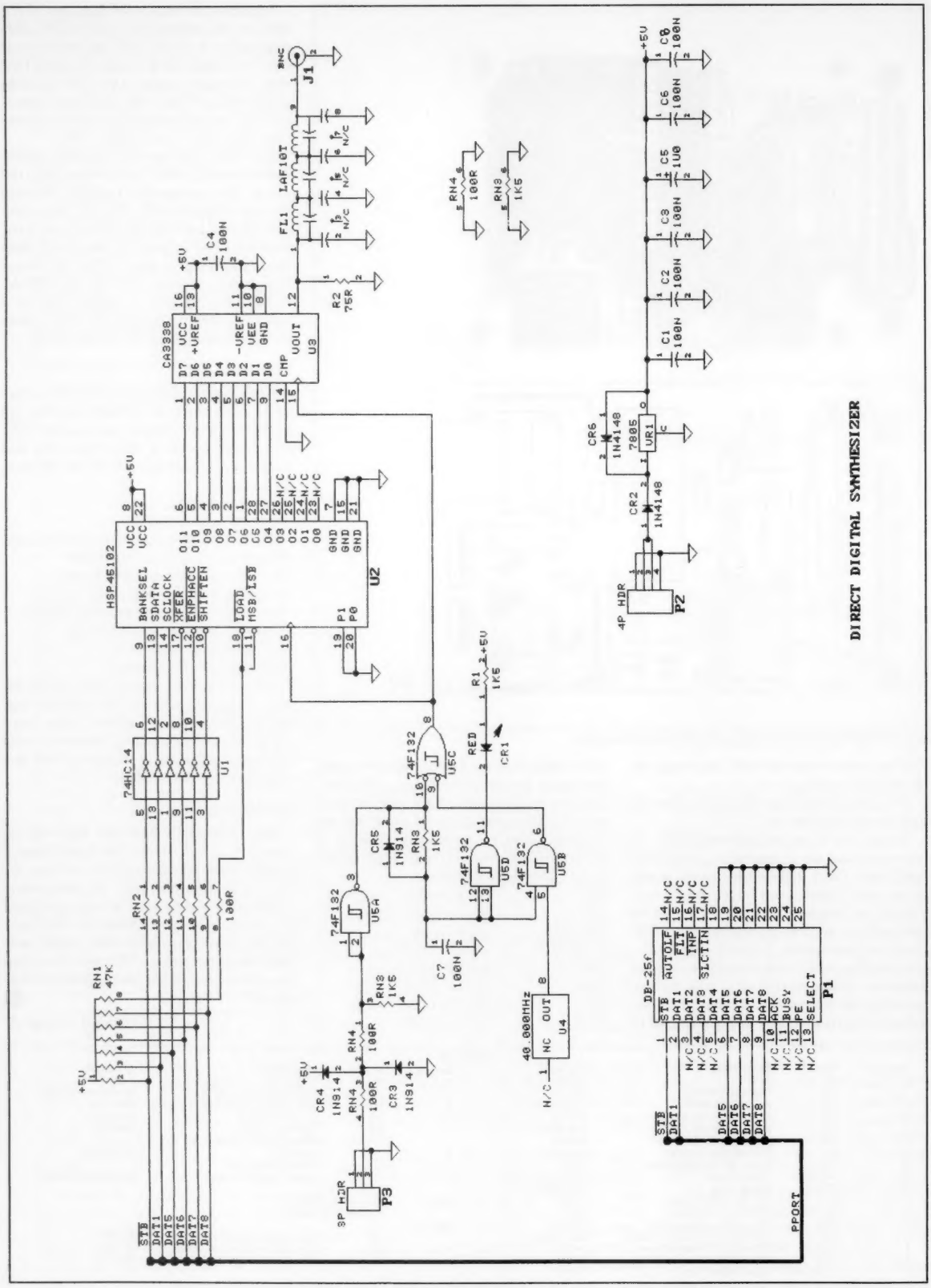



*Figure 3. Julieboard schematic.*

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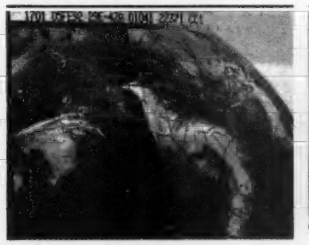

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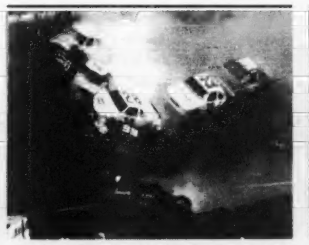

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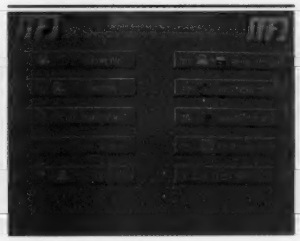

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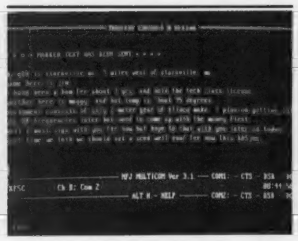

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## Selecting Variable Capacitors, Part II

Last month we introduced the topic of variable capacitors by showing two different types: straight line frequency and straight line capacitance. We examined their different styles of construction. We also looked at two-section capacitors and how they are used to tune doubly-tuned RF circuits and the RF/LO circuits of superheterodyne radio receivers. In this month's column we will take a look at transmitting variables, special variables, and some interesting related topics.

### Differential and Split-Stator Capacitors

Two special forms of air variable capacitor are the split-stator and the differential. The symbols for these devices are shown in Figure 1. The split-stator (Figure 1A) uses a common set of rotor plates, but two sets of stator plates. In other words, it is similar to a two-section variable, but with a common set of rotor plates rather than two sets. The capacitances of each section of the split-stator capacitor track each other. Any given change of shaft position causes the same capacitance on both C1A and C1B of Figure 1A. The differential capacitor (Figure 1B) also has a split-stator plate set, but they are configured with respect to the rotor such that the "shading" increases on one as it decreases on the other. Thus, C1A is at maximum capacitance when C1B is at minimum, and vice versa. A 2X-100 pF differential capacitor is shown in Photo A. The rotor is set to mid-range so that you can see clearly the opposed stator plates. As the rotor moves in one direction or the other, it will shade more of one set and less of the other.

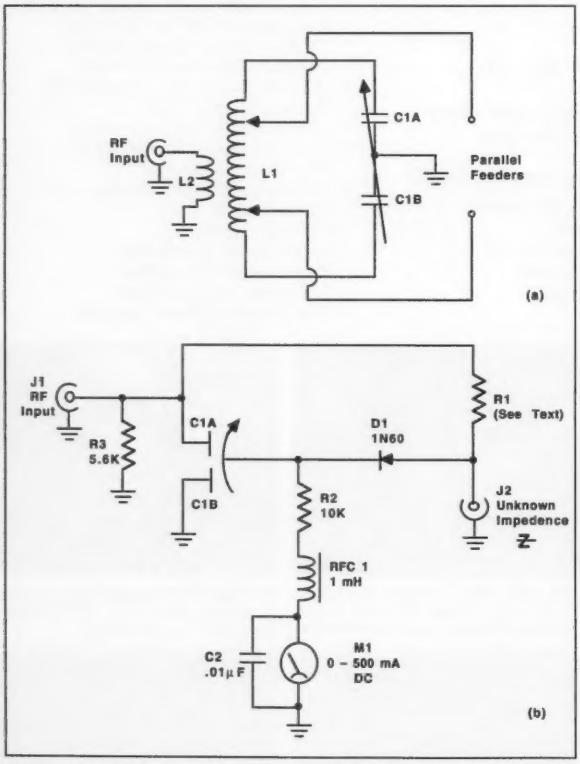


*Figure 2. A) ATU circuit using split-stator capacitor; B) Antenna RF bridge using differential capacitor.*

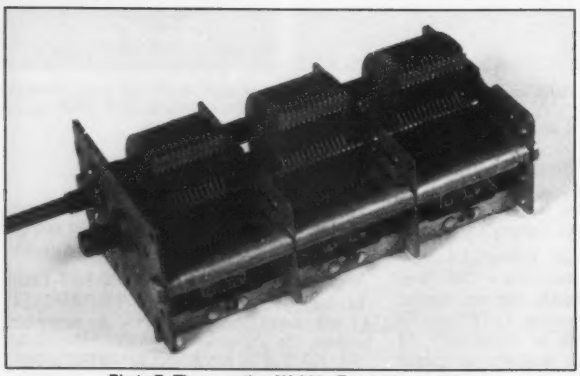

*Photo B. Three-section 3X-365 pF variable capacitor.*

Figure 2 shows how split-stator and differential capacitors are used in practical circuits. The circuit of Figure 2A is an antenna tuner for parallel feeder transmission line. The 50 ohm coaxial cable from the transmitter is connected to L2, which is a link coupling to the main inductor L1. This inductor has two taps, one for each wire of the parallel transmission line. In order to tune the inductor, a split-stator capacitor, with the rotor grounded, is connected across the length of L1.

The circuit in Figure 2B is an RF bridge that can be used to measure antenna impedance, or at least the resistive component of antenna impedance. The bridge is balanced when the ratio of the two halves are equal, or when:

$$\frac{X_{C1A}}{X_{C1B}} = R1/Z$$

(where Z is the unknown impedance). Resistor R1 is generally set to the system impedance, typically 50 ohms or 75 ohms. In most amateur radio applications it is permissable to use a 68 ohm resistor for R1 in order to accommodate both 50 ohm and 75 ohm systems with only a small error in each. Resistor R1 must be a non-inductive type, such as carbon composition or metal film. Excitation is provided by a signal generator applied to J1.

### Large Variables and Transmitting Variables

Photo B shows a large air variable capacitor that was salvaged from an old radio receiver. It is designed to provide 10 to 365 pF of capacitance in each section. In superheterodyne radio receivers, this capacitor would be connected such that one section tunes the RF amplifier input, the second section tunes the RF amplifier output (or, if no RF amplifier is used, the sections would tune a doubly-tuned LC resonant tank circuit), and the third section (with padder capacitor) would tune the local oscillator. If you go back far enough, when "tuned radio frequency" (TRF) receivers were the order of the day, all three sections were used to tune the RF amplifiers (and there was no LO in those receivers).

Other applications for capacitors such as the one pictured in Photo B are found where all three sections are connected in parallel. For example, the loading control of pi-network output tank circuits (used in vacuum tube final RF amplifiers in transmitters), often require 800-1200 pF of capacitance. The RF voltages are quite low

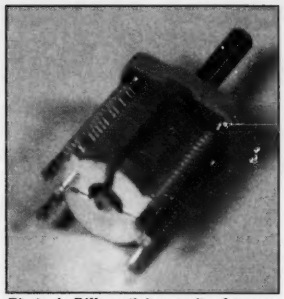

*Photo A. Differential capacitor from author's junk box (some "junk"—the bloody thing's expensive!).*

because the output impedance (50 ohms) is low, so it is not necessary to use wide "high voltage" spacing for the loading control (in most cases . . . always calculate for any given power level and allow a margin). Another 3X parallel situation is found in LF and VLF receiving antenna loops where high capacitance is needed. Also, some transmitting loops, as well as many receiving loops, use a single turn input/output loop (depending on point of view, RX or TX) to couple a multi-turn loop antenna to the rig. The multi-turn loop can be resonated with a relatively small capacitance, but the single-turn coupling loop typically wants to see a very high capacitance.

Photo C shows a "transmitting variable" that can be used in high power (2 kW) RF power amplifiers and antenna tuning units. What makes this a "transmitting" variable is the wide spacing between the plates. Wider spacing means that the breakdown voltage of the air insulator between the plates is increased. But wider spacing also reduces capacitance, so the plates tend to be larger and more numerous than in smaller capacitors of the same value.

Perhaps the ultimate in transmitting variables is the vacuum capacitor shown

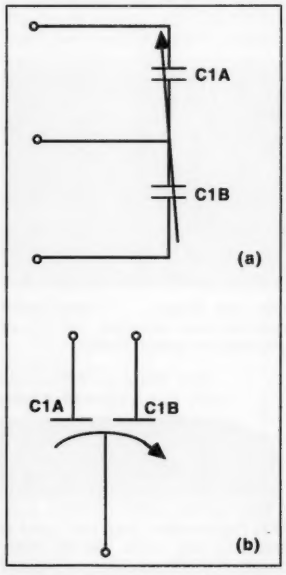


*Figure 1. A) Split-stator capacitor symbol; B) Differential capacitor symbol.*

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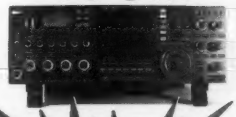

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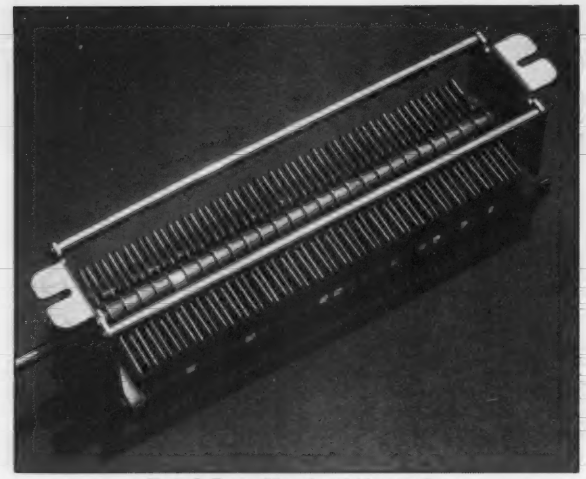

*Photo C. Transmitting air variable capacitor.*

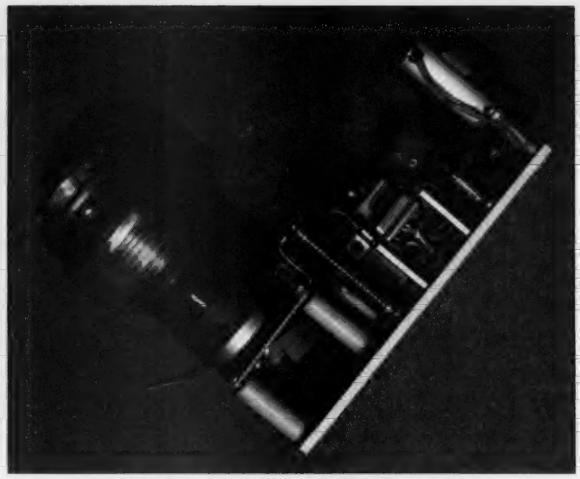

*Photo D. Vacuum variable (10-1000 pF) capacitor.*

in Photo D. Although vacuum variables tend to be quite high-priced, I bought this 10-1,000 pF unit from Fair Radio Sales (see Table 1) for less than $40 a couple of years ago. This particular capacitor is fitted with a small DC motor and a reversing relay. The capacitor is tuned by operating the motor, although it appears that removing the motor apparatus would make it possible to directly tune the capacitor.

### Calculating the Tank Circuit Component Values

When we design an RF LC tank circuit it is usually for a specified band of frequencies. For example: 3,500 to 4,000 kHz for the 75/80 meter band (we actually want to tune a small overlap, so 3,490 to 4,010 kHz is what we'll use). We need to know what values of inductor and trimmer capacitor to use with specified main tuning capacitors. We first select a trial variable capacitor for the main tuning job. Look in a catalog for the minimum and maximum capacitances. For this example, I selected a Hammarlund MC-100-M from Ocean State Electronics (see Table 1) with a capacitance range of 7.7 to 100 pF. Refer to Figure 3 as you use this procedure:

1. Determine minimum and maximum capacitance of C1 (7.7 - 100 pF).
2. Calculate $\Delta C$: $C1_{max} - C1_{min} = 100\ pF - 7.7\ pF = 92.3\ pF$.
3. Determine the required frequency ratio (F.R.):

$$F.R. = \frac{F_{max}}{F_{min}} = \frac{4010\ kHz}{3490\ kHz} = 1.15$$

4. Calculate the required capacitance ratio (C.R.) by squaring the frequency ratio:

$$C.R. = (F.R.)^2 = (1.15)^2 = 1.32$$

5. Calculate the minimum total capacitance from:

$$C_{min.} = \frac{\Delta C}{C.R. - 1} = \frac{92.3\ pF}{1.32 - 1} = 288.4\ pF$$

6. Calculate the maximum total capacitance:

$$C_{max} = C_{min} + \Delta C = 288.4\ pF + 92.3pF = 380.7\ pF$$

7. Calculate the inductance by selecting either maximum or minimum capacitance, and the lowest or highest frequency (as indicated by the capacitance value selected). I selected the maximum capacitance (380.7 pF) and minimum frequency (3,490 kHz) combination:

$$L = \frac{10^6}{4\pi^2 F^2_{min}\, C_{max}}\ \mu H = \frac{10^6}{(4\pi^2)(3{,}490{,}000Hz)^2\ (3.807 \times 10^{-10}F)} = 5.46\ \mu H$$

You can check the calculation with the normal resonance formula (below) to see if the correct frequencies are obtained at the minimum and maximum total capacitance (which correspond to the minimum and maximum values of C1 plus other capacitances in the circuit). The calculations should be accurate to within rounding errors (my calculator showed 3489+ and 4009+ kHz). The resonance equation is:

$$F = \frac{1}{2\pi\sqrt{LC}}$$

Where: F is in hertz, L is in henrys, and C is in farads.

In actual practice you will use a trimmer capacitor (C2 in Figure 3), and possibly a fixed capacitance (C3), to make up the difference between the required capacitance and the values obtained from C1. For example, we need a minimum capacitance of 288.4 pF, but C1 has a minimum of 7.7 pF. Thus, we need a total of 288.4-7.7, or 280.7 pF. The trimmer should have enough range to account for any tolerance errors in calculation and the values of the parts. I selected a trimmer with a range of 8 to 100 pF, with the idea of setting it approximately in the middle of the range (or about 46 pF ± a little bit). Thus far, of our required 280.7 pF, we've accounted for 7.7 + 46 pF, or 53.7 pF. We need to find an additional 227 pF. By using a 220 pF fixed capacitor at C3, we leave 7 pF for strays. In some RF circuits this is a reasonable value for strays, and the range of C2 (the "± little bit" part) can make up for errors. In some Colpitts and Clapp oscillators, however, there is a tremendous capacitance contributed by the capacitive voltage divider feedback network, so these calculations are wrong for that case.

Sources of supply for variable capacitors include hamfests (but look out for the "sharks" who have inflated ideas of their capacitor's worth—"a crudded up transmitting variable is not worth anywhere near the high price commanded by a shiny new one . . . at least to me"). Table 1 lists some of the places where I've bought variable capacitors in the recent past. The listing for Maplins in England can be used for Americans . . . they accept Visa and Mastercard. The bank card companies will convert the price from £ to $. Be a little careful reading the Maplin catalog, by the way . . . cost more than $ ($1.52/£ as of this writing), so the actual price is higher than it appears in the listing).

**Table 1. Variable Capacitor Suppliers**

Barker & Williamson
10 Canal Street
Bristol PA 19007
(215) 788-5581 (voice)
(215) 788-9577 (fax)
Transmitting variables.

Fair Radio Sales
1016 E. Eureka
Box 1105
Lima OH 45802
(419) 227-6573 (voice)
(419) 227-1313 (fax)
Transmitting and receiving variables (mostly surplus).

Ocean State Electronics
P.O. Box 1458
6 Industrial Drive
Westerly RI 02891
(401) 596-3080 (voice)
(401) 596-3590 (fax)
1-800-866-6626 (voice/orders only)
Transmitting and receiving variables (a lot of "new/old" material, i.e. capacitors that are unused, but of older construction).

Oren Elliott Products, Inc.
128 W. Vine St.
P.O. Box 638
Edgerton, OH 43517
(419) 298-2306 (voice)
(419) 298-3545 (fax)
Manufacturer, wholesales, and retailer of all sizes of transmiting and receiving variable capacitors, variable inductors, and vernier drives. Price list of standard products is available.

Maplin Electronics
P.O. Box 3
Rayleigh, Sussex, SS6 8LR
ENGLAND
+44 (0) 81 523-5977 (voice)
+44 (0) 81 523-4879 (fax)
Receiving variables, both UK and USA standard values.

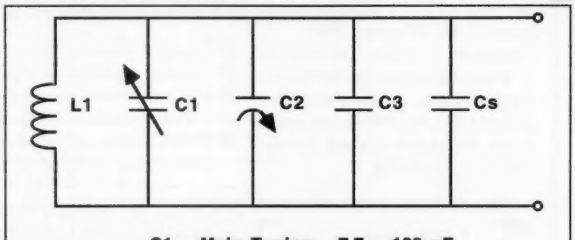


*Figure 3. L-C resonant tank circuit for example calculations.*

# In Memorium

**JA1MP**
**SAKO HASEGAWA**

March 10, 1929 to June 12, 1993

Founder, Chairman of the Board
Yaesu Musen Co., Ltd.
Tokyo, Japan

As an electronic engineer and amateur radio experimenter, Mr. Hasegawa introduced Single Sideband Radio telephony to amateur bands in Japan in 1956. He constructed SSB generators based on the works of his contemporaries in the U.S., and soon had many requests for complete transmitters and receivers. In 1959 he incorporated Yaesu Musen Co., Ltd. to meet the demand for this equipment. From his inspiration and under his guidance, the company developed the FT-101 transceiver which revolutionized amateur radio. His spirit of innovation and engineering excellence continued with the development of Yaesu's flagship transceiver, FT-1000, that has set a standard by which other top flight transceivers are compared. Mr. Hasegawa was known throughout the company as a hands-on president, taking personal interest not only in the lives and work of each of his employees, but in everyone who chose to use Yaesu equipment.

His call sign, JA1MP became well known in many countries. He was awarded the first Japanese RTTY WAC award in 1971, and remained active in amateur radio and associated activities throughout his life. During the 1980's he co-founded and served as president of the Japan Amateur Industry Association.

As a testimony to Mr. Hasegawa's pioneering spirit and interest in technological advancement, Yaesu has become a leading manufacturer of radio communications equipment throughout the world.

**YAESU U.S.A.**

Cerritos, California

# HAMSATS

## Amateur Radio Via Satellites

*Andy MacAllister WA5ZIB*
*14714 Knightsway Drive*
*Houston TX 77083*

### ARSENE Is Up!

A new satellite has joined the growing assembly of active amateur-radio spacecraft. In a spectacular night launch from Kourou, French Guiana, ARSENE and ASTRA 1C were sent to orbit on May 11th riding an Ariane 4 rocket. While the launch went well, the new ARSENE hamsat has had difficulties with the VHF, 2 meter transmitter. Fortunately the satellite also has a SHF, 13cm transmitter and has been available for ham activity since early June.

#### The Long Road to Orbit

ARSENE is an acronym for Ariane Radio-amateurs Satellite ENseignement Espace. The program began 15 years ago through the efforts of three groups in France: RACE (Radio Amateur Club de l'Espace), ENSAE (l'Aeronautique et de l'Espace), and CNES (National Center for the Study of Space).

Many technical schools, universities and companies joined the partnership to get ARSENE in orbit. The design and construction of the spacecraft involved over 300 students and donations of time, money and components to build the satellite and prepare a ground station for spacecraft control.

The primary goal of the ARSENE program is to provide a satellite for amateur radio operators to use for experimental communications. The program is also devised to contribute to educational programs for satellite design and telemetry studies. When launch day finally arrived, thousands of individuals had a stake in the mission.

#### The Launch Campaign

The rocket used to send ARSENE to space was provided by Arianespace and marked the 56th Ariane launch vehicle. The launcher was first prepared for flight in December 1992 to carry a Hughes communications satellite. The Ariane 4 rocket was configured with two solid-rocket, strap-on boosters. The launch was canceled due to technical concerns by Hughes. The rocket was moved back to the preparation area and re-configured for two strap-on, liquid-fueled boosters (42L configuration).

The Ariane launcher stands over 55 meters and weighs 362 metric tons at liftoff. It is a three-stage rocket using exotic fuel, asymmetrical dimethyl hydrazine with nitrogen tetroxide, in the lower two stages and liquid hydrogen and oxygen in the third stage. This configuration was designed to take nearly 3,000 kg of payload to a geostationary transfer orbit (GTO) with an apogee, or high point, of 36,000 km and a perigee, or low point, of 200 km.

The countdown on May 11th proceeded smoothly. Launch was nominal and all systems performed well. Both payloads were delivered to GTO and released to the customers; BETZDORF of Luxembourg for ASTRA 1C and RACE for ARSENE.

#### The Payloads

The main payload for flight V-56 was ASTRA 1C. It is the third spacecraft in the direct-to-home European TV satellite fleet. ASTRA 1C weighs 2790 kg. and can carry 34 TV channels through 18 transponders. Stabilization is three-axis and available power is 3300 watts from the solar panels at the end of the satellite's estimated 15-year life.

By comparison, ARSENE is very small at only 154 kg. The craft is spin-stabilized, has an estimated lifetime of three years with an estimated end-of-life power of 42 watts provided by a sheath of gallium-arsenide solar cells. Compared to most hamsats however, ARSENE is large, complex and powerful. It was designed to carry a Mode "B" digital communications system using standard AX.25 packet on three separate 70-cm uplinks to a single two-meter downlink. A second transponder was designed for linear operation using Mode "F" (like Mode "S" on AMSAT-OSCAR-13, but with a downlink 46 MHz higher). The uplink is 16 kHz wide and centered on 435.100 MHz with a downlink centered

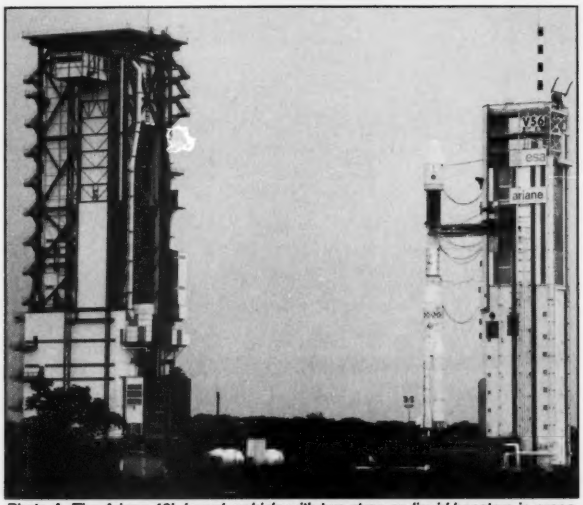


*Photo A. The Ariane 42L launch vehicle with two strap-on liquid boosters in preparation for launch from Kourou, French Guiana, May 11, 1993. (Arianespace photo.)*

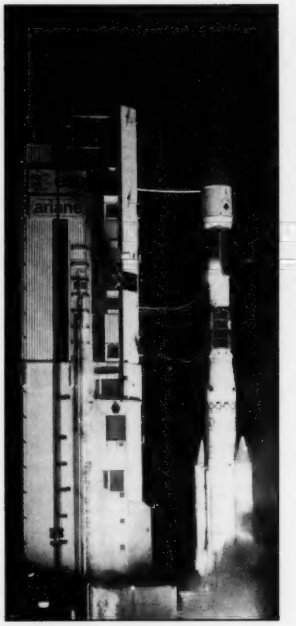


*Photo B. Liftoff of the Ariane 42L launcher from Kourou, French Guiana, with ARSENE and ASTRA 1C on May 11, 1993. (Arianespace photo.)*

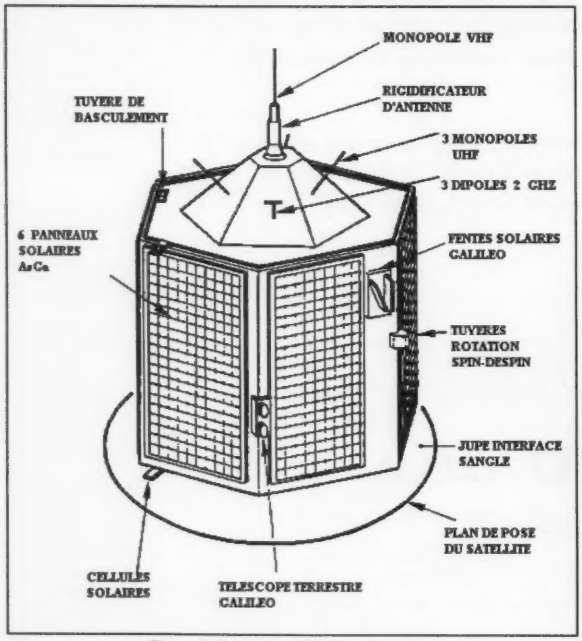


*Figure 1. External ARSENE configuration.*

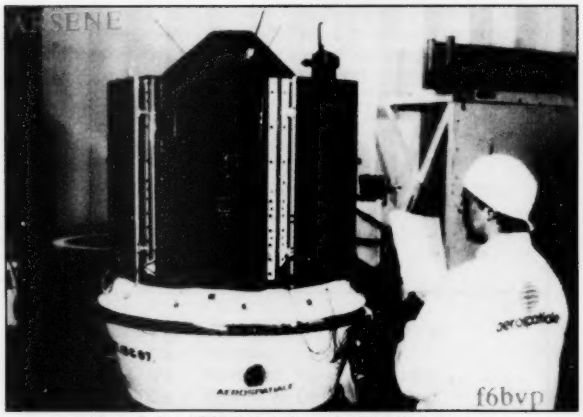


*Photo C. The ARSENE satellite undergoing final checkout.*

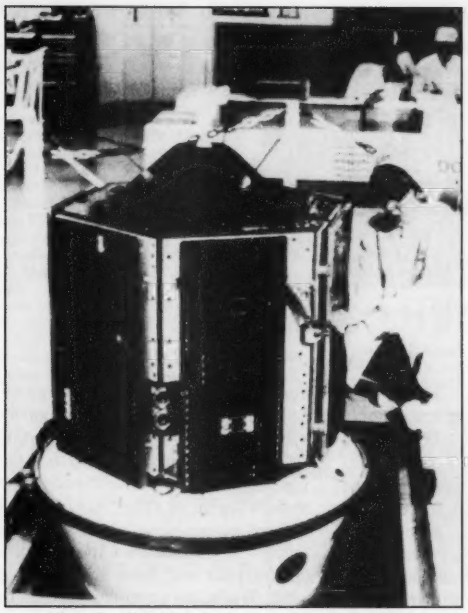

Photo D. ARSENE in final preparation prior to launch.

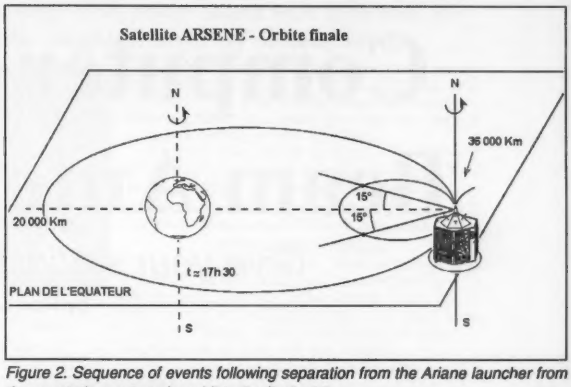


Figure 2. Sequence of events following separation from the Ariane launcher from the geostationary transfer orbit to the final orbit.

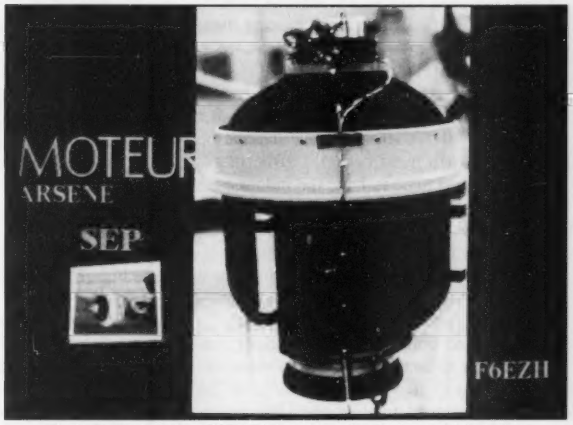


Photo E. View of the ARSENE internal booster for final orbit insertion.

on 2446.540 MHz. High-speed CW telemetry is sent on 2446.470 MHz.

**The Problem**

An amateur radio monitoring station on Reunion Island in the Indian Ocean of the east coast of Africa was the first to be in range of ARSENE after release to GTO. The 2 meter downlink signal on 145.975 MHz was expected but not heard. A second Reunion station also reported no signal.

Fortunately the S-band transmitter was working and the ARSENE control station FF1STA in France could receive telemetry on their 7 meter dish. Preparations were made to fire the onboard booster rocket to raise the dangerously low perigee to the desired height of 20,000 km.

Several theories have been suggested concerning the silence of the 2 meter transmitter. The most probable cause is a break in the cable from the transmitter to the antenna or perhaps serious antenna damage. Signals have been detected on the 2 meter downlink, but are so weak that only serious moonbounce stations have reported reception. The designers and builders in France will continue searching for explanations and possible cures.

**It's Time for S-Band**

Rather than mourn the loss of ARSENE's two-meter transmitter, many stations have begun modifying and upgrading their home stations to work with the new satellite on Mode "F." Any station capable of 500 to 1000 watts EIRP on 435.100 MHz can hit the uplink. A 50-watt transmitter to a 10-dB gain antenna will work. For the downlink on 13cm more effort is required. While A-O-13's S-band transponder can be heard on a two-foot dish with appropriate preamps and converters, ARSENE cannot. The signals are nearly 10 dB down from A-O-13 levels. This means that a six-foot dish is needed, or some other array with similar gain. The downlink frequency may require some modifications to existing S-band receive converters due to the 46 MHz difference with A-O-13's downlink.

Articles in recent issues of the AMSAT Journal by Ed Krome KA9LNV and James Miller G3RUH show some ideas on S-band gear for A-O-13 and ARSENE. Ed also wrote "Elementary Mode S" in the March 1991 issue of *73* describing some of his efforts to get results without pain at 2400 MHz.

Companies that provide receive converters and preamps include Down East Microwave (Bill Olson W3HQT) at (207) 948-3741 and SSB Electronics (Jerry Rodski K3MKZ) at (717) 868-5643. For ARSENE reception, adapted six-foot or larger TVRO dishes can provide the needed gain when used with a small helix antenna at the dish focal point.

Most of the pictures and figures shown were down loaded from Kitsat-OSCAR-23 at 9600 bps in .GIF image format. Further details on the satellite and its telemetry can be found in the March 1993 "Hamsats" column. ARSENE represents a real challenge for satellite enthusiasts. The DX opportunities from its high eliptical orbit are excellent and well worth the effort to configure a station for S-band reception. When Phase 3-D (the next high-orbit satellite) is launched a few years from now, the S-band system promises to be one of the most popular modes.

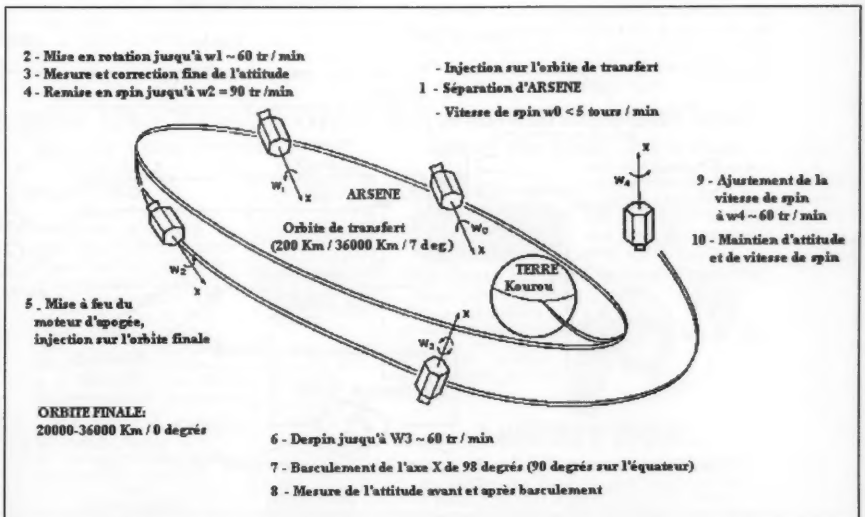
2 - Mise en rotation jusqu'à w1 ~ 60 tr / min
3 - Mesure et correction fine de l'attitude
4 - Remise en spin jusqu'à w2 = 90 tr /min
- Injection sur l'orbite de transfert
1 - Séparation d'ARSENE
- Vitesse de spin w0 < 5 tours / min
ARSENE
Orbite de transfert
(200 Km / 36000 Km / 7 deg)
TERRE
Kourou
9 - Ajustement de la vitesse de spin à w4 ~ 60 tr / min
10 - Maintien d'attitude et de vitesse de spin
5 - Mise à feu du moteur d'apogée, injection sur l'orbite finale
ORBITE FINALE:
20000-36000 Km / 0 degrés
6 - Despin jusqu'à W3 ~ 60 tr / min
7 - Basculement de l'axe X de 98 degrés (90 degrés sur l'équateur)
8 - Mesure de l'attitude avant et après basculement

Figure 3. The "Orbite finale," or final orbit, planned for ARSENE is very different from all previous hamsats.

# Computer Control for Beam Antennas, Part 1

*Give your station a smart, new twist.*

by Ron Cole K4OND

If you are an experimenter, you have almost certainly seen bargain TV antenna rotators at hamfests and speculated about using them for ham antennas. You may have hesitated at buying an untested rotator even at five bucks. Hesitate and speculate no more! Those rotators work very well for lightweight VHF/UHF antennas, and can be easily fixed (in most cases). Furthermore, you don't even need to have the indoor control box to make them work. Even if you already own or plan to buy a heavy-duty rotator intended for ham use, most of the principles in this article still apply, and may save you some bucks on repairs when those units fail. This article will also show you how to do automated pointing and/or tracking, including how to control the antenna via a joystick. Although it is aimed primarily at the use of TV antenna rotators and UHF antennas for satellite communications, this article will also teach you a lot about how to take full control of other rotators. In Part I we will look at how typical rotators work, how to control them electrically, and how to read out the azimuth and/or elevation. In Part II we will extend the concepts to computer interfacing, automated pointing, and joystick control.

## Rotator Basics

The rotator motor itself is a surprisingly small device, running at about 3600 rpm, and geared down to produce the final antenna speed of about 1 rpm or less. The motor power, supplied through the control cable, is usually about 40 VAC derived from a transformer in the control unit. There are actually three power connections to the motor. One of these is connected to one side of the 40 VAC winding; the other two control the direction of rotation. One of the big mysteries of rotators, direction control, is actually very simple (see Figure 1). A relatively large unpolarized capacitor (C1) is used to produce a phase shift between the other two motor power connections, and it is this phase shift which controls the direction of rotation. Thus, controlling direction only requires a switching of one side of the 40 VAC winding to one side or the other of the phase-shift capacitor. This is done inside the control unit as a part of the direction dial function. By the way, these capacitors are a high-failure-rate item: Almost every "bad rotator" I have found turned out to have a bad phase-shift capacitor. Fortunately, you can easily get a replacement at most appliance repair and electrical supply stores; they are known as "motor-run" capacitors. They come in a wide range of values and are rated at voltages well above the 40 VAC used in this application. All you have to do is find an approximate match to the one in your control unit; I have capacitors as much as 50% higher in value than the original one without any problems. Before I learned about motor-run capacitors I tried back-to-back electrolytics and those apparently will not work. While this experience is only based on TV rotators, it almost certainly applies to other rotators as well. It's the first place to look when your rotator won't rotate!

It's not enough to just control the direction of rotation, of course. You also need to get feedback on position (i.e., azimuth), and to stop the rotation when the desired position is reached. In most TV rotator controllers the position feedback is produced by an electromechanical coupling, driven by a solenoid. Refer again to Figure 1. Within the rotator housing, and as a part of the step-down gearing, a rotating cam is used to close the contacts of a switch. The cam is higher up in the gear train and rotates much faster than the antenna. It can produce switch closures for about every five degrees of antenna rotation (depending on the exact model). Each switch closure results in activating a

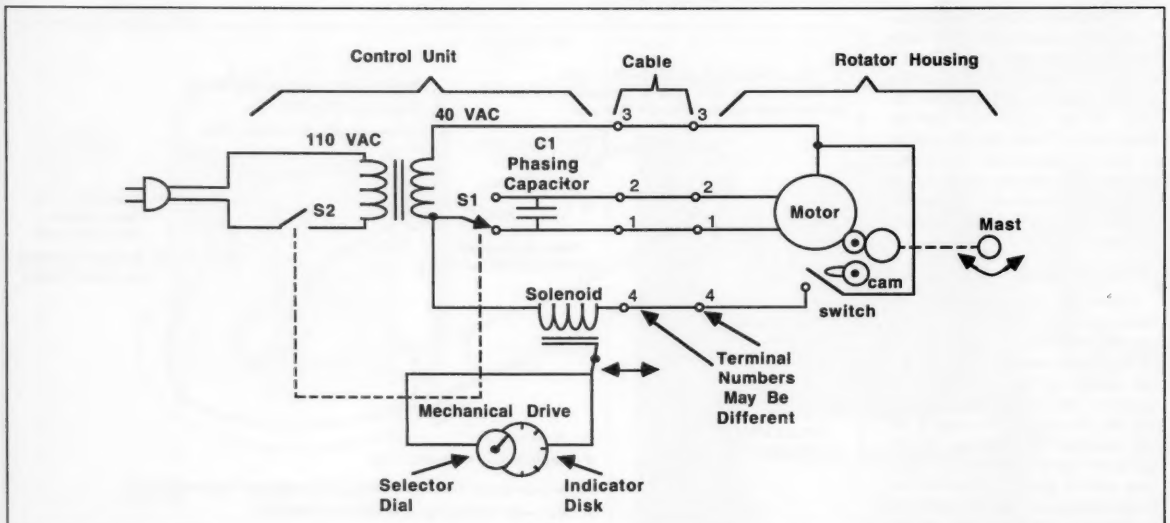


*Figure 1. Typical rotator and control box.*

# Ameritron *doubles* average SSB power . . .

***NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .***

**Ameritron's** all NEW AL-80B kilowatt *output* desktop linear can *double* your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

**You** get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube between words. It saves hundreds of watts wasted as heat.

**You** get a full kilowatt PEP *output* from a whisper quiet desktop linear. It's a compact 8½"H x14"D x15¼" W and plugs into your nearest 120 VAC wall outlet. Covers all bands 160-15 Meters, including WARC and MARS bands (user modified for 10/12 Meters with license).

**You** get 1000 watts *output* on SSB, 850 watts *output* on CW, 500 watts *output* on RTTY, an extra heavy duty power supply, genuine Eimac 3-500Z tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatibility, Two-Year Warranty, Made in USA, plus much more for only $1195.

***Dynamic ALC™* doubles average SSB power**

**The** AL-80B's exclusive *Dynamic ALC™* gives you high-level low-distortion RF processing. When activated, it can more than double your *average* SSB power and produce up to 6 dB improvement in intelligibilty. It maximizes your talk power without distortion and splatter.

**A** convenient front panel control lets you adjust your output power level.

***Instantaneous RF Bias™* eliminates heat**

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**Gutsy Heavy-Duty Power Supply**

**The** guts of the AL-80B is its heavy ***heavy*** duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using *two* 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.

**NEW! $1195** Ameritron AL-80B Suggested Retail

***Genuine* Eimac® 3-500Z Tube**

**The** AL-80B uses a *genuine* Eimac® 3-500Z tube warranted by Eimac® -- not cheaper, less reliable 3-500Zs used by some competitors.

**600 WATTS OUT . . . $649**

**A tough low cost linear with REAL transmitting tubes!**

**Ameritron's** new AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desk top linear that's so compact it'll slide right into your operating position – you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet.

**You** get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

**Select the 3 tube 600 watt out AL-811, $649 – or the new 4 tube 800 watt out AL-811H, $795.**

**70% efficiency**

**The** AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

**Superb** RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

**A** whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

***Tuned Input* lets your rig deliver full output**

**A** 50 ohm broadband Pi-Network *tuned input* is used.

**Pi/Pi-L Output Network**

**A** carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

**Has** ball bearing vernier reduction drives with logging scales on plate and load controls.

***Step-Start Inrush Protection™***

***Step-Start Inrush Protection™*** stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

**Multi-Voltage Power Transformer**

**Ameritron's** exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

***Dual* Illuminated Cross-Needle Meters**

**Ameritron's** dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions -- you can tell right away if something is wrong.

**QSK Compatible**

**The** fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

**For** *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

**Plus more . . .**

**An** *Standby* switch lets you run barefoot, but you can instantly switch to full power if you need it.

**Has** transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

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***These 3 rugged linears all use a super heavy duty hypersil power supply capable of 2500 watts!***

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AL-1500 **$2625** Suggested Retail

**Ameritron** super power amplifier uses the herculean Eimac• 8877 ceramic tube.

**It's** so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

## Ameritron's Dual 3-500Z linear

AL-82 **$1995** Suggested Retail

**This** linear gives you full legal output using a pair of Eimac• 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

## Ameritron's 3CX1200A7 linear

AL-1200 **$2095** Suggested Retail

**Get** ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

# AMERITRON brings you the finest high power accessories!

## Legal limit antenna tuner

ATR-15 **$399** Suggested Retail

**Ameritron** — *the high power specialist* — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

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**Oil** cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95

ADL-1500X **$39.50** Suggested Retail

## Remote Coax Switches

RCS-8V **$149** Suggested Retail

**RCS-8V, DC-UHF 5 KW Coax Switch.** Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $169.95** with "N" connectors.

**RCS-4, $134.50. 4 position HF switch.** Similar to RCS-8V. No control cable needed. Handles 2500 watts PEP.

RCS-4 **$134.50** Suggested Retail

## QSK-5 Pin Diode T/R Switch

**$349** QSK-5 Suggested Retail

**Self-contained,** connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

## Step-Start Inrush Current Protector

**Stops** power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

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CIRCLE 148 ON READER SERVICE CARD

solenoid in the control unit, and a mechanism connected to the solenoid turns the position indicator. (It is the firing of that solenoid which produces the typical "clack . . . clack . . ." sound when the rotator is turning.) A very messy set of mechanical and electrical components is used to cause the indication wheel to turn in the right direction, and to stop when the position indicator wheel is aligned with the direction dialed in by the user.

Another, and less common, type of position readout scheme involves using a second motor inside the control unit itself, and running exactly in parallel with the motor in the rotator on the mast. This second motor has a similar step-down gear train, but all it does is drive the position indicator wheel. Again, a mechanical or electrical scheme is used to detect when the two dials match, and stop the rotator. You can easily distinguish between these two types of rotator and control units. The first type (with a switch in the rotator) requires a four-wire control cable (three for the motor, one for the switch); the second type needs only three wires in the control cable.

Both of these types of position indicators are noisy and not easily adapted for any type of position readout other than the mechanical indicator dial. I have also found a few failures in the mechanisms which are virtually impossible to repair. Fortunately, we will soon see how the whole control box can be thrown away (except the 40 VAC power transformer and phase-shift capacitor).

There is one other feature of TV rotators which is important if your intended use is in a satellite antenna elevation system. This feature is the method for attaching the mast to the rotator. For easy adaptation to elevation use, you need to find a rotator which allows the mast to pass completely through the housing (see Photo A). You may have to do some searching to find one of these; they seem to be of older manufacture. All of the new rotators I have seen on the market are built so that the end of the mast rests on the rotator housing itself, or on a plate which is a molded part of the housing. If the latter type is the only one you can find, it may be possible to carefully cut the plate off and allow the mast to extend beyond the housing in both directions. This approach is necessary since the elevation rotator will normally be mounted at the top of the vertical mast, with a horizontal boom extending out both directions for the antennas themselves. (You may also want to use this type for an azimuth rotator, for the reason discussed below on using potentiometers for position readout.)

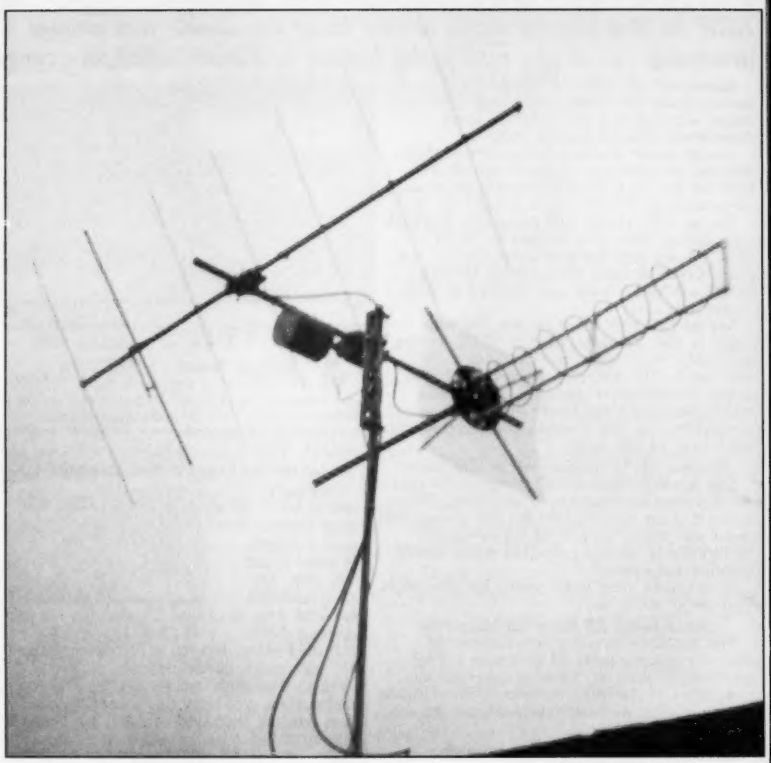

*Photo A. K4OND's remote-controled rotating 2-meter yagi and 70 cm heilx antennas.*

Now let's put together a better manual system, and one which is readily adapted to computer control.

### A New Control System

It is trivially simple to construct a system to control motor direction and starting/stopping rotation. All it takes is the 40 VAC transformer, a good capacitor, and a center-off toggle switch (a good one is the Radio Shack #275-710, which is spring-loaded for the center-off position). See Figure 2. When you hook up the power wires to the rotator

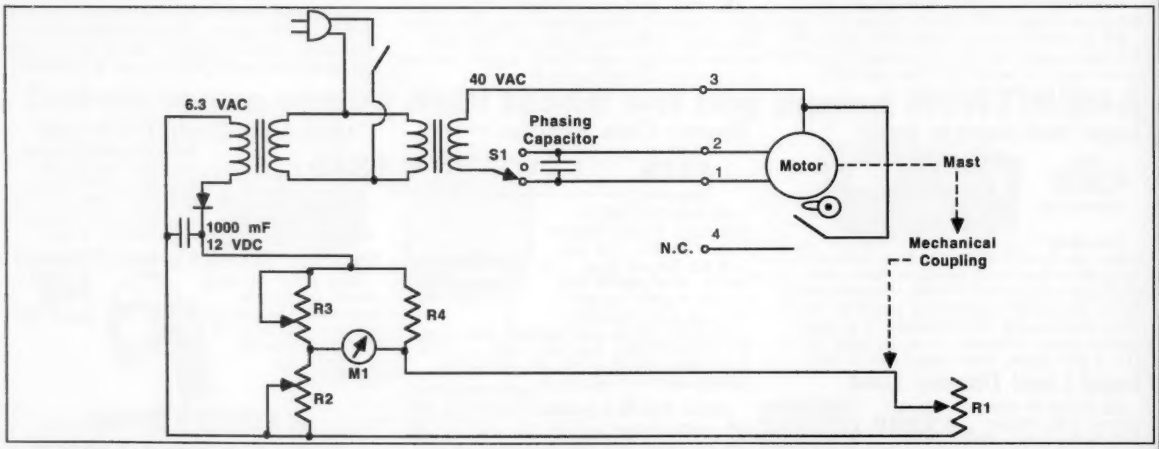


*Figure 2. Simple "manual" controller and display. S1 is a center-off toggle. R1 and R2 should be equal, approximately 10k; R3 and R4 should be equal, approximately 5k. M1 should be 0-1 mA, up to 0-10 mA. If a less sensitive meter is used, decrease R1-R4. Adjust R2 and R3 for zero and full scale as R1 varies over its range. Duplicate the circuit if a second rotator is used.*

motor, the only one which is critical is the lead which goes directly to one side of the 40 VAC transformer. The other two leads are completely interchangeable. The critical lead is usually marked "3" on the terminal strip on the rotator housing. If all else fails, just try different combinations until you find the right one; the motor will not be damaged by brief periods of wrong connections, it just won't run. The next part gets a lot more involved: how to get feedback on antenna position, and how to display it in an attractive way.

**Analog Position Readout Concepts**

These "analog" schemes involve mechanically coupling a potentiometer to the mast or boom. With the potentiometer turning in synchronism with the mast (or boom), you can use a meter to read voltage (or current) through the potentiometer, and calibrate the meter in terms of position. We have to find a way to accomplish this mechanical coupling. One of the problems you will find in the case of the azimuth rotator is that ordinary potentiometer shafts don't turn a full 360 degrees like the mast, so you will have to step the rotation down with different sized gears or belt pulleys, or go to a 10-turn potentiometer. I did find a set of gears which could fit into the rotator housing, in place of the cam which normally operates the solenoid-control switch. I brought the shaft out through a hole drilled in the housing and coupled it to a 10-turn potentiometer, but finding these parts was more pure dumb luck than anything else. It is certainly possible to use a rubber drive belt (such as can be found in VCR repair shops) passing around the mast and over a pulley attached to the potentiometer shaft, or maybe even a fairly large "rubber tire" wheel on the potentiometer shaft, mounting it so that the "tire" bears directly on the rotating mast.

A better scheme would be to find a fine-toothed gear which is a little larger than the mast; take the gear and a short section of mast to a machine shop and get them to cut a mast-sized hole through the center of the gear, and braze the gear onto the mast section. Simply insert the short mast section into the rotator, and add more mast sections as needed. Then, mount the potentiometer, with a matching gear, on the fixed portion of the rotator housing so that the gears mesh. Finally, if you can find one of the rotators which allow the mast to pass completely through the rotator, you can put a wooden plug into the very bottom end of the mast, drill a hole slightly less than 1/4" in the center of the plug, and force-fit a shaft into the plug. Then you can couple the pot to the shaft (through a step-down gear, or use a 10-turn pot). Obviously, some mechanical ingenuity is required in any of these methods.

For the elevation rotator, there is a simple scheme which works very well. This scheme involves attaching a potentiometer to the horizontal boom, with the shaft of the pot in line with the boom, then hanging a weight on the potentiometer shaft. As the boom rotates

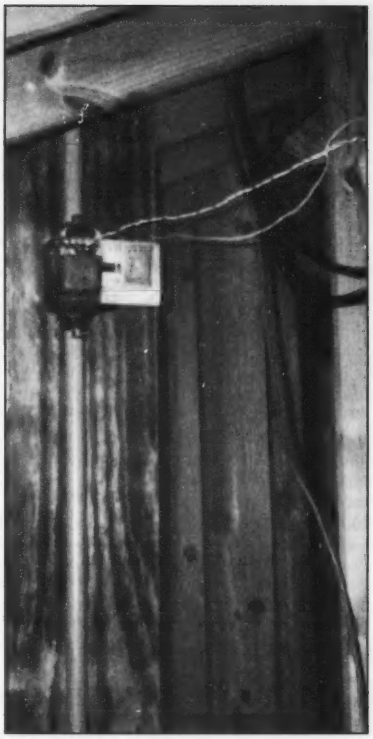

*Photo B. The azimuth rotator is mounted between the rafters and the ceiling joists.*

up and down, the weight turns the potentiometer shaft, producing the desired change of resistance. Since the elevation will normally be a maximum of 90 degrees (i.e., from horizontal to straight up), we don't even have to worry about exceeding the potentiometer shaft rotation limits. In my elevation system, I simply fastened a large coffee can to the underside of the boom, and mounted the potentiometer and weight inside the can for protection from weather and wind effects. This scheme, while very simple and effective, does have one drawback: As the boom is turning, the weight has a tendency to swing slightly, causing the meter needle to oscillate as well.

As shown in Figure 2, each sensor potentiometer is connected as one arm of a bridge circuit, with the 0-1 mA meter as the position indicator. Typical values for the bridge components are as listed in the figure, but many others will work, and you will probably have to do some "trial and error engineering" anyway to get the meter to deflect full scale as the sensor pot moves. Do this on the bench, before you mount the pots on the rotators!

Although it is possible to use other devices including rotary switches, or even to electronically count the closures of the solenoid control switch, using potentiometers for position sensors has a real advantage if you intend to go all the way to a computer-controlled system: You can read the potentiometers through "joystick" ports, and use software to convert the reading to an antenna position. (We will explore the concept in Part II of this article.)

**Mechanical Assembly**

Although this article is mostly about controlling rotators, a few words about rotator mounting may be of help when you build your system. If you used an azimuth rotator which allows the rotating mast to pass completely through the rotator housing, you can save some strain on the rotator by mounting it near the bottom of the mast and placing a bearing of some type under the mast bottom. In one such installation, I poured a small block of concrete in the ground, and stuck a three-foot section of mast near the center. The fixed portion of the rotator mounts on that short section. The rotating mast passes through the rotator, with the base of the mast resting on a ball-bearing mount salvaged from a heavy-duty caster assembly with the wheel removed. The bearing "bears" most of the weight of the mast. The concrete block is about a foot away from the wall of the shack; just below the eaves of the shack a support arm extends from the wall, fitting around the rotating mast just tight enough to provide support without clamping the rotation.

Another method, which worked very well, was to cut a hole in the roof of the shack for the mast (and using a rubber vent-pipe boot to prevent leaks). The azimuth rotator mounts on a vertical board between the rafters and the ceiling joists, and the mast rests on a bearing on a platform on top of the joists. (See Photo B.) The rotating mast protrudes through the roof only about six feet, but absolute height is not that significant when the satellites are more than a few degrees above the horizon. In both cases, the elevation rotator is mounted on an aluminum plate (an old rack panel) mounted to the vertical mast with U-bolts. Holes are drilled in the plate to accept the bolts on the elevation rotator which originally clamped the rotator to a vertical mast. You may be able to make out enough details in Photo A to see this scheme, as well as the 2 meter yagi and 70cm helix in my system, and the coffee can which holds the elevation potentiometer and weight. The two antennas are placed so as to balance the weight on the boom, including the counterweight protruding from the rear of the helix. Close attention to balance will go a long way towards preserving the life expectancy of the rotators.

That's it for Part I. We have seen how to control rotators, how to fix the most common problems with non-working rotators, how to get rid of the electromechanical control unit, and how to get electrical position readouts which are much easier to see than the dial on the original control unit. Is it worth the trouble? Maybe not if you only want to have manual control of your antenna position, but if you want to do computerized control and automatic positioning/tracking, the conversions described above are essential. In Part II we will expand the system to one which provides both manual and computer control, and even allows for the use of a joystick as the control device.

Number 14 on your Feedback card

# PACKET & COMPUTERS

*Jeffrey Sloman N1EWO*
*75 Herriott Street*
*Franklin IN 46131*

**More Internet Options**

I think columns on Internet connectivity get more response than any other subject. I have had many requests for some TCP/IP info—these haven't been ignored. I am working up to a TCP/IP series, so stand by. In the meantime, here's some information for you Internet junkies out there that I think you will find fascinating.

**What is the Internet, Anyway?**

For the uninitiated among you, here's the scoop. The Internet—note the big "I"—is an enormous network of computers of every description. These computers are located in educational institutions, military installations, commercial enterprises, even hamshacks. These machines—in one way or another—are all connected together using TCP/IP (Transport Control Protocol/Internet Protocol).

TCP/IP—often just called "IP"—was developed by DARPA, a Defense Department wing—to make the Internet possible. The idea of the Internet is something similar to the Interstate system. The federal government built the interstate system citing national security issues. How could Washington be expected to defend California without a road to get there? While the need for the Internet was not quite as clear-cut, some way was needed for the educational, military, and research organizations who worked together on defense department projects to share data.

Today, the infrastructure of the Internet is maintained by private, regional companies who sell connections and maintain the complicated "routers" needed to insure that your messages get to their destinations.

**How About Ham Radio?**

Hams get involved in at least a couple of ways. First, quite possibly the most common implementation of TCP/IP protocol for the PC was written by a ham—Phil Karns—and bears his call as a name, KA9Q. The Internet uses Ethernet—a networking scheme developed by Xerox at PARQ (their Palo Alto Research Center). Ethernet connections require special hardware, a board called an NIC (Network Interface Card). Each card has its own special "driver" software that understands its hardware and allows other software to communicate through it. With KA9Q, these drivers are called "Packet Drivers" (no direct relationship to packet radio) and are available in the public domain—making them very popular.

Because these drivers are interchangeable—new hardware, just get a new driver—it is possible to create one for use with an amateur TNC (Terminal Node Controller) running in KISS (Keep it Simple, Stupid) mode. This means that the KA9Q software can be used to run TCP/IP protocol over the air using nearly any modern TNC. This is the heart of TCP/IP amateur operation.

***"For the uninitiated among you, here's the scoop. The Internet—note the big "I"—is an enormous network of computers of every description."***

Ham stations running TCP/IP offer some interesting possibilities. One really big one, not lost for a moment on the hams involved, is the use of the Internet to send data anywhere—or nearly anywhere.

The only problem these hams had—other than malfunctioning keyboards, brought on by the drooling anticipation of actually making this connection—was to insure that FCC regulations were not violated. They had to be sure that access to radio transmitters located at the end of these Internet links were accessible only to licensed hams. To do this, they came up with the idea of "encapsulation." This bit of Internet magic is a little hard to understand. The basic idea is to wrap a TCP/IP frame (data packet) inside another one—encapsulating it. This successfully hides the true origin and destination of the frame, and makes it possible to control which ones will get through to the radios. The term "wormhole" was adopted for this technique, which is very successfully used today.

Wormholes now connect hams in places like Australia, Hawaii, California, Indiana, and even countries in Europe. Practically speaking, this means that I can take a look at a BBS in Melbourne, Australia, from my home in southern Indiana, using a 5 watt handheld. Fun, fun, fun!

**Getting Involved**

As I said in the introduction, I plan to write a series of columns on getting started in TCP/IP. However, there are at least a couple of ways to get involved with this exciting Internet world without TCP/IP.

First, from the radio side. Thanks to the growing popularity of IP as a way of networking PBBSs (Packet Bulletin Boards Systems), the idea of AX <—> IP gateways is catching on. With these systems, the packet user connects to the PBBS using ordinary AX.25 (packet) protocol, and the PBBS provides access to the Internet functions through a menu. This is lots of fun.

The WG7J PBBS software seems to be the most popular, so I'll discuss it. First of all, the PBBS will allow the exchange of packet messages just like any PBBS. There is a difference in presentation, though. With a WG7J system, messages are collected into areas, and the area command (abbreviated "a") allows the user to switch among them. The areas are based on topics, like SALE, BARTER, WX, etc. There is also an area created for each user—any messages to you will appear in an area named with your call. This is a much more convenient system to use than the more familiar WØRLI type listing.

Many of the other commands will be familiar or self-explanatory. I will ignore those and concentrate on two Internet options, "finger" and "telnet."

**Finger**

The Internet utility finger is used to query a remote system for information. It has two basic purposes in the Internet world, one is to get information about users and systems—the other to get specific text files offered by systems for the convenience of users.

The first use allows a user to determine if a particular person is a user of, or is known by, a machine. The syntax is simple:

finger N1EWO

would tell you whatever the system you are currently using knows about me.

finger N1EWO@K9IU.AMPR.ORG

would tell you what the PBBS run by the folks at Indiana University in Bloomington knows about me.

The other use is also simple. What you can do with it depends on what the sysop at the system you are fingering wants to offer. For example:

finger weather@iugate

will return the NWS forecast for central Indiana. This is one of the ways in which Internet resources are available.

**Telnet**

The telnet utility is very powerful, if very simple. Basically, it allows you to connect, as a user, to any system willing to have you. For example:

telnet n8imo.ampr.org

will connect me to N8IMO's WG7J PBBS in Michigan. When you telnet you will generally be logging into a UNIX system (or something acting like a UNIX system). You will be presented with a prompt:

login:

Use your callsign, then when prompted for a password, try "amateur" (omit the quotes). There are two things to keep in mind. First, UNIX logins accept just about every

?,A,B,C,D,E,F,H,I,IH,IP,J,K,L,M,N,NR,O,P,R,S,T,U,V,W,X,Z # h

**Usage**

H[elp] [<command-name>]

**Description**

The help command will display help for a given command. The help command by itself, displays this particular message. To get help for a specific command, enter "help" followed by a space and then the name of the command you want described. The following commands have help descriptions available for them:

| | | | | | |
|---|---|---|---|---|---|
| area | bye | connect | download | escape | finger |
| help | info | jheard | kill | list | musers |
| nodes | operator | ports | read | send | telnet |
| upload | verbose | xpert | what | zap | |

**Examples**

help area (displays a description of the "area" command)
h download(displays info about downloading files)

*Figure 1. "The help command output for a WG7J system. Note the unusual commands like "finger" and "telnet" used for Internet connections—see the text for more."*

character your keyboard can generate as part of the user name and password. If you mistype, a backspace may not clear up the problem. The second thing is that UNIX is case sensitive—that is, it cares about the shift key. Type the call and password in all lowercase. If you do not, the system may not let you in, or it may decide that you want everything in UPPER CASE FOR THE REST OF YOUR SESSION. This can be very annoying.

Other resources available via telnet are various sorts of "servers." These machines offer information of all sorts which can be very useful. For example:

telnet 141.212.196.79 3000

will connect you to the University of Michigan's "Weather Underground." This is a weather server that provides nearly every text product produced by the National Weather Service, including forecasts and severe weather bulletins. This is a marvelous resource for you "Sky Warn" participants out there.

**Coming in the Other Way**

I told you I'd have some exciting news for Internet junkies! Those of you with landline Internet access can get involved from the other direction. If you have access to Internet telnet, try:

telnet K9IU.UCS.INDIANA.EDU

Login with your callsign and the word "amateur" for a password. The first time you log in, you won't be able to do much except leave a message to the sysop (s sysop). Leave a message requesting access, along with the password that you want to use. In a few days, you'll have an account—and "amateur" will no longer work as a password. Once you have access you will be able to telnet onto the amateur IP network and have lots of fun.

There is a lot more to the Internet and ham radio than what you have read here. I hope you choose to explore it. Keep your eye on this column for more information.

**A Request of Sysops**

If you are a sysop of an AX <—> IP gateway, I would love to hear from you so I can let people know that you exist. Send mail to:

jsloman@bix.com

with your PBBS info, including your frequency and intended coverage area.

73 de N1EWO.


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# RTTY LOOP

Number 15 on your Feedback card

*Marc I. Leavey, M.D., WA3AJR*
*6 Jenny Lane*
*Baltimore MD 21208*

Every once in awhile, I am reminded that the name of this column is "RTTY Loop," and that, to many of you, putting such a loop together remains a mystery. To that end, I am including, this month, the circuit shown in Figure 1.

**Oldies but Goodies**

Submitted by Bob Roehrig K9EUI, of Batavia, Illinois, is an answer for the ham who is looking for an efficient way to put an older teleprinter on-line. Bob writes that the first section of this circuit (shown in Figure 1) "is a selector magnet driver circuit that I have used for many years on my Model 28 equipment running on 60 mA." The 120 VDC can be obtained from a line isolation transformer and the appropriate diodes and electrolytic capacitors, or else use a pair of back-to-back filament transformers.

"The reason for using around 120 volts is simply that the selector magnets work better. Granted that you can get 60 mA from 24 volts or so . . . with the higher voltage you will have a greater range on the printer's range finder. Using 120 volts and the 2k resistor also provides a simpler means of obtaining a constant current supply.

"My driver circuit accepts low voltage input (such as an RS-232 source). The marking state does not have to be a negative voltage, but can just go to zero volts. The transistors are wired as a Schmitt trigger to square up the waveform. Q2 must be a high voltage transistor such as an MJE-340 or ECG-157. R4/C4 limit the spike when the switching transistor turns off.

"The second section is the circuit which connects to the keyboard or TD contacts. It is also powered from the 120 volt supply. The output is 10 volts during spacing.

"Many people don't realize that there are two different kinds of selector magnets used in the Model 14 and Model 15 (and Model 19) equipment. The 'pulling' assembly uses round-shaped magnets and the 'holding' type assembly uses smaller diameter but slightly longer magnets. These have a square-shaped pole piece as opposed to a round one. The pulling type magnets are always wired in series and are always to be used at 60 mA. The holding types are wired in parallel for 60 mA and series for 20 mA circuits. It is always a good idea to use these at 60 mA. Some of the holding type selector assemblies have a toggle switch near the magnets to switch between the 20 mA and 60 mA configuration.

"There were some military versions of the Model 15 that had some real high resistance magnets. These were intended to be wired directly into the plate circuit of the keyer stage of the tube type terminal units. Normal selector magnet resistance is around 60 ohms each, if I remember correctly."

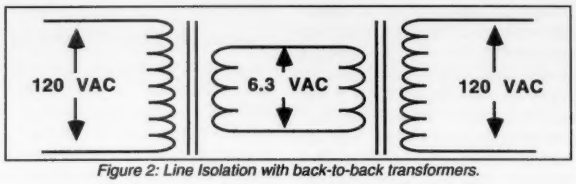


*Figure 2: Line Isolation with back-to-back transformers.*

**Hot Stuff**

Let's deal with this in a little more detail, Bob, as I believe that there are quite a few who remain mystified by the inner workings of a teleprinter. To begin with, Figure 2 deals with that "line isolation" question. You see, if you have noticed, we are dealing with a 120 volt loop supply. *But if you have the bright idea to just rectify the line voltage, DON'T!* Since one side of the power line is "hot," and one side "ground," you would stand a 50:50

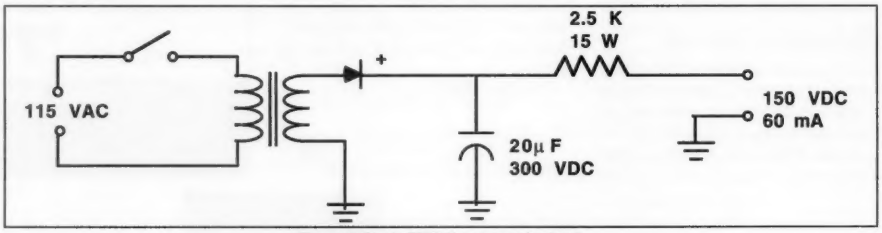


*Figure 3: Basic RTTY Loop supply circuit.*

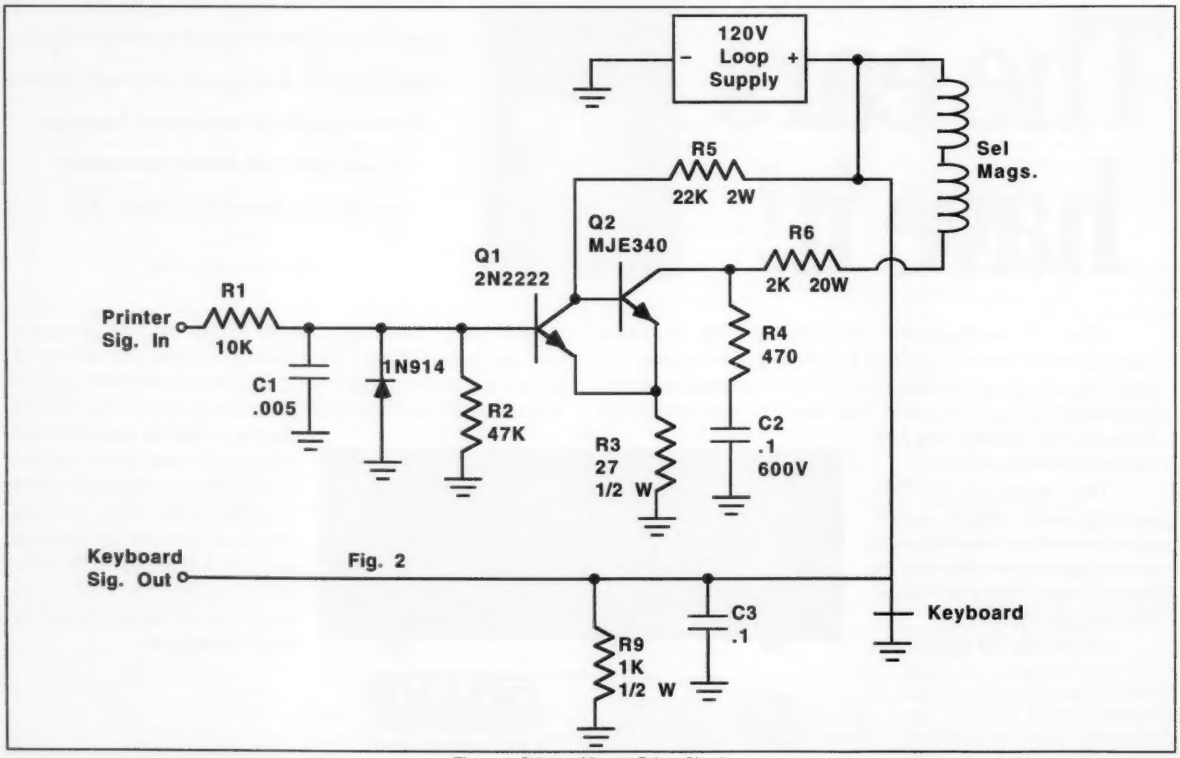


*Figure 1: Selector Magnet Driver Circuit.*

chance of rendering the chassis of your teleprinter hot, creating a potentially lethal situation.

A line isolation transformer simply isolates you from that situation, without changing the voltage. Connecting the secondaries of two filament transformers to each other, as shown in Figure 2, accomplishes just that goal, at minimal cost.

As for the loop supply itself, it can be as simple or complex as you would like it. Figure 3 is my favorite basic supply. Just a transformer, a diode, and a capacitor are all you need to get basic direct current. The current limiting resistor is needed because of the low resistance of the selector magnets. In the typical Model 15 teleprinter, there are two selector magnets, each with a resistance of 105 ohms. Accessible on terminals 45 and 46 on the side of the machine, they may be connected in either series or parallel. A series circuit, with a total resistance of 210 ohms, is designed for operation at 20 mA, and a parallel circuit, with a combined resistance of about 52 ohms (according to Bob's memory), is for the more common 60 mA loop. Now, if the loop supply delivers 150 volts, and the resistance of the magnets is about 52 ohms, the resultant current would be (remember Ohm's law?) 150/52, about 3 amps! "Burn out those magnets real quick, don't 'cha think?" Therefore, a series resistor is included to limit the current to the proper 60 mA current. Normally, this is about 2000 to 2500 ohms. It is important to make this a high powered resistor, though, as, for example, with our 150 volts at 60 mA, the wattage will be 150 x 0.06, about 9 watts.

So there you have it, a simple driver for older machines to let you run a teleprinter off a low level signal. Hope this is useful to you, and I look forward to receiving other thoughts on this ever-changing subject.

**Collect the Whole Set!**

Speaking of changing, the latest disk of software is filling up, with more RTTY goodies. Any of the four of the collection can be yours. Just send either a 5.25" or 3.5" disk, $2 per disk to be filled, and a note telling me which collection you want, along with a self-addressed, stamped disk mailer, and I'll get it back to you right away. Collections #1, #2, and #4 are RTTY/packet programs; collection #3 is a bunch of archiving and viewing utilities. Just send me a self-addressed stamped envelope if you want a list of what's in each archive collection, if you want to peek first.

I look forward to more mail and comments this month. The summer is here and we can all feel energetic. Drop me a note at the above address, or Email via CompuServe (ppn 75036,2501), Delphi (username MarcWA3AJR) or America Online (screen name MarcWA3AJR). 73


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# HOMING IN

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## Radio Direction Finding

*Joe Moell P.E. KØOV*
*P.O. Box 2508*
*Fullerton CA 92633*

### For T-Hunters Only . . . Not!

As you leaf through ham magazines, you won't find ads for lots of products designed specifically for transmitter hunters. Nevertheless, radio direction finding (RDF) enthusiasts can find many items that are useful on "foxhunts" or "T-hunts", as RDF contests are called.

Often, the sellers of these products don't mention their foxhunting applications. I suspect that's because they are unaware of them! This month, we will look at three offerings that are aimed at the mainstream ham radio market, but are of special interest to T-hunters.

#### World's Lightest Yagi?

Hiking and emergency preparedness, as well as RDF, were on the minds of Mike Walker KAØVFF and Al Lowe NØIMW when they developed the Arrow Antenna (Photo A). This 4-element 2 meter yagi is rugged, yet very lightweight. It can be assembled and disassembled quickly. Elements fit into the aluminum boom or the supplied PVC pipe carrier for storage and transport.

T-hunters quickly recognized this beam's suitability for mobile RDF. They have been talking it up since construction plans were published in the April 1992 issue of *73 Amateur Radio Today*. For example, I recently communicated with hams in Montreal and Memphis who use arrow designs on their local hunts. Many RDFers have duplicated the antenna from the magazine article, while others have purchased theirs ready-made from the Arrow Antenna company.

KAØVFF has stepped aside, leaving NØIMW as the sole proprietor of Arrow Antenna. Al and his family are churning out yagis and doing a brisk business at hamfests and via mail order. "I've been selling a lot of them to hams on the front range here in Colorado," he says. "Search and rescue is using them, and so are some balloon trackers."

Al and Mike cleverly picked lightweight aluminum arrow shafts for their beam elements. At about 1-1/4 pounds, the Arrow Antenna is much easier to turn at low vehicle speeds than my PVC-pipe stiff-wire T-hunt quad. I was surprised when I compared Arrow shafts to the usual hollow aluminum antenna tubing. An Arrow element of the same outside diameter and length weighs only half as much as a tubing element!

Masts and associated hardware are not supplied by Arrow Antenna. Al says a metal mast does not impair the beam pattern, but I used thick-walled PVC pipe for my mobile tests. I mounted a U-bolt permanently to the mast and drilled two pairs of holes in the boom at the center of gravity. This allowed me to change the yagi quickly between horizontal and vertical polarization without affecting my mast pointer alignment. Some T-hunters have designed 90-degree hinges for instant polarization change.

In my RDF tests, the Arrow Antenna had slightly higher gain than my regular 4-element quad. Its front-to-side and front-to-back pattern was excellent. Good SWR was obtainable across the entire 2 meter band.

For close-in hunting on foot, Al suggests reconfiguring the antenna by removing the front director and swapping positions of the other director and reflector on the boom. This gives you a 3-element beam with a 15-inch mast handle in the rear for easy carrying.

Despite its light weight, this yagi withstands the rigors of mobile foxhunting well. Parts and workmanship of NØIMW's antennas are guaranteed for one year. Al says, "In my T-hunting experience with tree limbs and street signs, the only damage has been to bend the 8-32 studs that attach the elements. These can be easily straightened or replaced to finish the hunt." Replacement threaded rod is readily available around the country.

#### RF by the Numbers

A field strength meter (FSM) is a simple untuned receiver that visually indicates the relative strength of the surrounding RF field. Hams most frequently use FSMs to compare the gain and directivity of antennas, and to tune/adjust antenna matching networks.

T-hunters use FSMs for close-in RDF when the fox's signal overpowers sensitive portable receivers such as handie-talkies and scanners. Probing on foot with a FSM is called "sniffing."

Inexpensive unamplified FSMs require 50,000 microvolts or more of RF input for usable indications, making them unsuitable for sniffing except when the transmitter is inches away. Amplified sniffers have more sensitivity, but some have limited meter range or touchy zeroing adjustments.

I.C. Engineering has just introduced a DC-to-microwave FSM with digital readout. The "I.C." in the company name isn't short for "integrated circuits." It stands for Ismael Charnabroda KD6TU, the company's owner. Ismael, a former aerospace engineer turned entrepreneur, is enthusiastic about his product.

The Digi-Field (Photo B) is a rugged plastic box 4-3/8" x 3-1/4" x 1-3/4" with an SO-239 antenna connector on top. An 18-1/4" telescoping whip antenna is also supplied.

The 1/2" high 3-1/2 digit liquid crystal display is ideal for antenna pattern checks. Set the unit on a fence or ladder several wavelengths away from the transmitting antenna under test and watch the readings on this FSM with binoculars as you tune and tweak the antenna or transmitter.

Battery life won't be a problem with the Digi-Field. It draws only 2 milliamperes, so its 9V alkaline battery will last hundreds of hours. An indicator tells you when the battery drops to 8V, but in my tests the accuracy was not affected until the voltage got down to below 4V.

With only one control (the on-off switch), operation of the Digi-Field is straightforward. KD6TU doesn't provide a detailed instruction manual, but he offers technical assistance by phone to buyers.

The original Digi-Field ("A" model) and its telescoping antenna will detect a 1-watt 2 meter handheld with "duckie" antenna at 65 feet. Overrange occurs at about two feet from the HT. The new "B" model is more sensitive, overranging at 25 feet.

Because the Digi-Field has an unshielded case, body capacitance affects readings. To avoid this, mount the unit to your sniffing antenna mast instead of holding it in your hands. Avoid touching the coax connector when sniffing, as the reading will be affected.

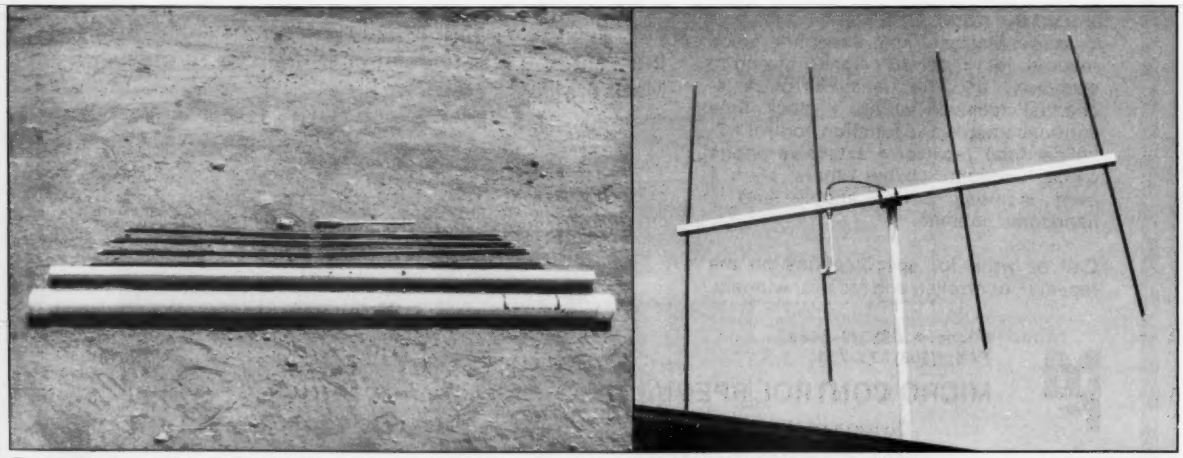

*Photo A. The Arrow 2 Meter Yagi Model 144-4 has a suggested retail price of $89.00 and is available from Arrow Antenna, 1461 Peacock Pl., Loveland CO 80537; (303) 663-5485. The latest model features caps on element ends for safety, instead of the sharp points shown here.*

No sensitivity control is provided. You can shorten the antenna or add external attenuation to reduce the meter reading. However, the Digi-Field's internal wiring can pick up RF, so close-up measurements of powerful T's may not be possible, even with the whip antenna collapsed or removed. With the antenna disconnected, the 1 watt rig overranged the B model at 6 inches.

Digi-Field responds to RF from low frequencies well into the microwave spectrum. Full sensitivity is available to 1000 MHz, and reduced sensitivity continues to 12 GHz. While this is generally useful, it means that strong ambient RF fields can mask the signal you're looking for. You don't have to be at a communications site to have high RF fields. When I held the B model over my head in the center of a large suburban park in Fullerton, California, the indication went to half scale, even though I was blocks away from the nearest transmitting antenna.

The detector output jack on the side of the Digi-Field can be hooked to an audio amplifier and speaker or phones to give you an idea of what is being received. Only amplitude modulation can be detected in this way; you cannot copy FM signals. The jack will not drive an earphone directly, and the wiring to your amplifier can cause additional unwanted signal pickup.

As with all FSMs, Digi-Field measurements are relative, not absolute. The digital readings are not in dBm, milliwatts, microvolts, or any other units. KD6TU will provide typical power-versus-readout graphs on request. You can perform your own crude calibrations with a laboratory signal generator, but your indications will vary with frequency, temperature, and source impedance. For foxhunt sniffing, all we care about is relative strength, so this is of little concern.

*Photo B. The Digi-Field Model A and B Field Strength Meters have a suggested retail price of $119.95 and are available from I.C. Engineering, 16350 Ventura Blvd., Suite 125, Encino CA 91436;(818) 345-1692 (Tech. Info.), (800) 343-5358 (Orders).*

**Lilliputian ID-er**

Engineers at Communications Specialists weren't thinking of the RDF market when they designed the ID-8, a miniature CW identifier. But Mike Wolfe N9CHQ, who purchased one of the first units, was quick to see its T-hunt possibilities. He wrote to me on CompuServe that an ID-8 is the brains of a fox transmitter he built to put on hunts for the North Shore Radio Club in Highland Park, Illinois.

The ID-8 is a tiny circuit board (1-7/8" x 1-1/8") with a surface-mounted 6805 microprocessor, EEPROM, and voltage regulator. Hook it to a transmitter and it will generate CW identification at programmed intervals, either by keying the carrier or by providing a keyed sine wave tone to the modulator.

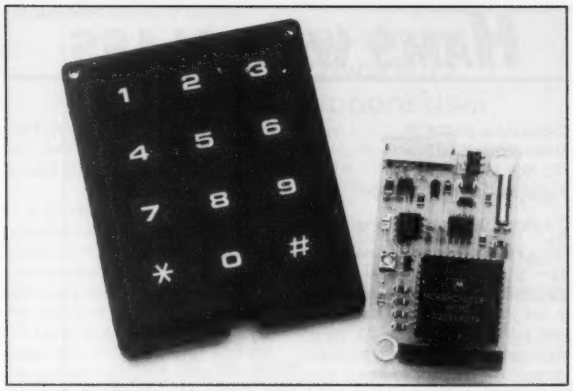


*Photo C. The ID-8 identifier board and keypad has a suggested retail price of $89.95 and is available from Communications Specialists, Inc., 426 Taft Ave., Orange CA 92665; (800) 854-0547; (714) 998-3021.*

The ID-8 can send up to eight separate CW messages. The eight messages can be played successively to form one long message of up to 216 characters. Messages are entered with a supplied 12-button keypad (Photo C), which is plugged into the ID-8. With this keypad, you also instruct the IDer how fast to send the CW (1 to 99 WPM) and how often to send the message (continuously, by external command, or spaced up to the 10-minute FCC limit).

There are several other programmable parameters including tone frequency and dead-carrier delay time before the message. When programming is completed, parameter and message data is stored in the EEPROM. You can then remove the keypad until you need to change callsign or timing for another hunt.

The ID-8 needs only 6 milliamperes from a 6 to 20 volt DC source. A 9V transistor radio battery will power it for days. Comm-Spec says it's immune to thermal variations and RF fields. The operating temperature range is -30 to +65 degrees Celsius.

N9CHQ was quite pleased with the ID-8 as a fox controller. Though it lacks the distinctive tone patterns of the foxboxes discussed previously in this column, it was just right for his club's on-foot beginners hunts. "What I like about the unit is that I can program the ID and timing in the field," he wrote. "Normally I use 25% duty cycle, 15 seconds on, 45 seconds off. I program in the ID and then adjust the code speed so that it lasts for 15 seconds including a short delay on keyup. I then set the off time.

"Once it is programmed," he adds, "I connect a 3-conductor cable to the transmitting HT. I turn on the unit and it runs by itself. The unit's timer appears to be very stable. During the hunts in which we have used it I have not noticed any drifting in the timing circuit. It really works beautifully, and does not need any shielding."

From my standpoint, the main appeal of the ID-8 is its size. An IDer and keyer this small seems perfect to go with the subminiature VHF transmitter described in the May 1993 "Homing In." KB6TTS and I are designing an FM modulator and interface to connect these two boards. With luck, we will have tested circuits for you next month.


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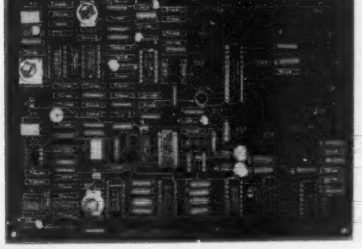

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## Dayton '93 Youth Forum

It's always an auspicious occasion when grown-ups get together to honor the achievements of children. Certainly, the young adults who showcased their achievements at the '93 Dayton Hamvention Youth Forum deserved the spotlight. It was an honor to moderate a forum with such talented children from across the country.

Our first speaker was Rusty Smith KD4GLC, who is 17 years old and is an Assistant Section Manager in Kentucky for the ARRL. His main responsibility is to recruit young people into ham radio. Rusty is interested in DX-ing and contesting. He told us that his goal was to lead the state of Kentucky in the Novice Roundup using CW only. He succeeded, and said that this event was the most fun he has had so far as a ham radio operator.

Barry Kennedy N2PNG is 16 years old and comes from New Hampshire, where he attends the Dublin School. Barry is active in recruiting young people and has done some teaching at Crotched Mountain School. This is a rehabilitation facility that has had some extraordinary results with their young people through the use of amateur radio classes.

I would never run a youth forum without at least one member of the distaff side. Shauna Richards N7NGT is a bright, pretty 17-year-old young lady from Rock Springs, Wyoming. Shauna was the first teenage girl in Wyoming to earn a ham license. That was on 8/8/88. In 1990 she earned 1st and 3rd place at the district and state science fairs *as a freshman* in the senior engineering division. Her winning science project was on five modified 2 meter antennas that would function well even if trapped under a collapsed double-decker highway, such as the one which fell in the 1989 San Francisco earthquake. Then, in 1991, she received the Hiram Percy Maxum Memorial Award.

Matthew d'Alessio KC6VIM is 15 years old and lives in San Anselmo, California. He captivated the audience with his eloquence and confident manner in front of such a large group. Matt spoke about how much he enjoys CW. He also enjoys working 2 meter FM with his hand-held radio. Matt says, "There is nothing like working the world on a few dots and dashes on a cold winter night. I have talked with hams in 60 countries using these "crazy beeps." Matthew got a terrific reaction from the young people in the audience.

Eric Permut KBØKQF is a 12-year-old from Boulder, Colorado. I first heard about Eric from Rip and Ellie Van Winkle, who run license classes in Boulder. The Boulder Amateur Radio Club sponsors "BARC Jr." for young people. Eric is vice president of that club. He also handles net control for the junior hams' net on a local 2 meter repeater. Eric successfully wrote a grant application for his school to buy ham radio equipment. The young man regularly operates bicycle mobile and has constructed an innovative J-pole antenna for his bike. He brought the antenna to the youth forum to show everyone, along with a display of photos of the BARC Jr. club members.

Mike Placco KB8LCC is a 16-year-old from Milford, Michigan. Mike was a shortwave listener first before he became a ham. He has held the position of secretary of the Milford Amateur Radio Club. Mike enjoys HF, CW, and contesting. He enjoys helping his teacher with the radio club at the local high school. I was pleased to learn that many of these young amateurs contribute to recruiting and helping programs too.

Ten-year-old Luke Ward KØ4IQ is from Alexandria, Virginia. The audience members were visibly excited when they learned that Luke has earned his Advanced license. In fact, Luke holds Novice classes for third graders. He gave a "professional" presentation with the overhead projector, showing graphs that gave statistics about children of hams becoming licensed. He helped found the Springfield Estates Elementary School Amateur Radio Club which has as one of its purposes: To provide a vehicle whereby parents, students, and teachers can share common interests and work toward common goals.

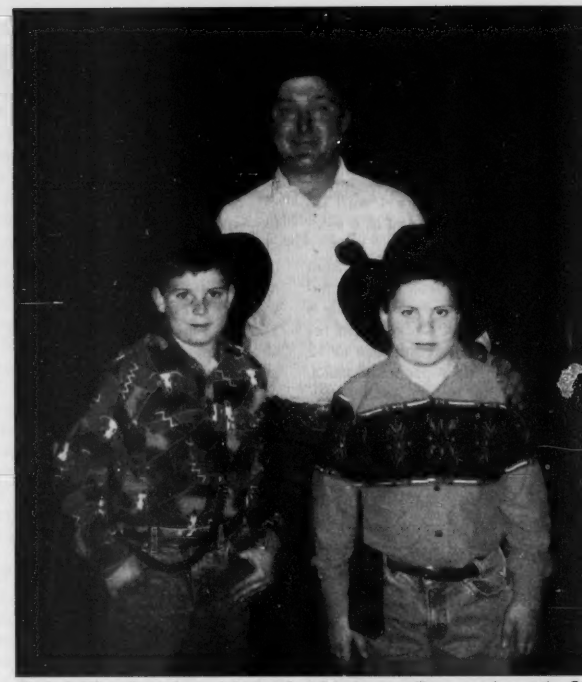

*Photo A. When these three visit a hamfest, it looks more like a round-up at the O Corral! Pictured are Cody KB5WYJ, Casey KB5UE, and dad Marty Haley AB5G at the Dayton Youth Forum.*

Casey Haley KB5UE and his brother Cody KB5WYJ are 8 and 10 years old respectively (see photo). Casey has a General license and Cody a Tech Plus. These two youngsters from Houston, Texas captivated the audience with their ability to communicat what they love about amateur radio They both were introduced to the hob by by their Dad, Marty AB5GU, an Mom, Wende KB5TNU. The boys en joy packet and CW. I've invited th Haleys to join me in June at the Texa HamCom in Arlington.

It's always a personal pleasure fo me to work with youngsters from a across the country at various youth fo rums. This time, I was especially hon ored to meet and help feature suc talented and eloquent young adults. invite everyone to attend the youth fo rum in Texas. Come and see the bes that our hobby has to offer. Come an see the future of amateur radio! By th way, Yaesu has donated a 2 meter H to be given to a very lucky youngste at the forum. See you there!

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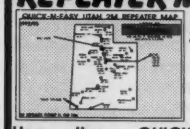

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### Fixing an Argonaut 509 (Continued)

Now that I've made a complete fool of myself with the Argonaut, it's time to get down and get serious! It's also time to break out the test gear and the soldering iron, along with the manual.

Since we have verified that the Argonaut is producing 2 watts RF output, the next step is to be sure the transmitter is producing power on all bands. A quick check with the wattmeter proved all bands were producing RF. Since the problem had to be in the metering circuit, that's where I started to look.

#### The Metering Circuit

The metering circuit is contained on one PC board mounted to a switch shaft. You must remove the PA module to get to the SWR board. This board is not removable by unplugging it from a socket. There are many wires coming out of the board, and each is soldered in place. There is enough slack in the wires to allow the board to be moved from its cubbyhole out into the open. To do this, remove the two nuts from the switch shaft holding the board to the switch. Be careful—they are very small and are easy to drop inside the radio.

After you have the two nuts removed, notice there are several washers and spacers on the studs. Carefully remove these and lay them aside. Now, pull the PC board back out from the shaft. After the PC board has cleared the shaft, you can pull it up slightly. If you can't move the board, don't pull it or force it to move. Doing so will break off a wire.

Since there is no indication of forward RF, then the most likely suspect would be a diode in the RF pickup sensor. In fact, the diode must be the one used to read forward power. The schematic shows this to be diode D1. It's a 1N32A type germanium diode.

Not being one to check diodes, I simply replaced it with a new diode. Don't use a 1N914 silicon diode! You'll not get the desired results if you do. You must use a *germanium* diode. If you can't find a 1N32A, then try a 1N60. Radio Shack sells a pack of 1N32A diodes for about two bucks.

After the new diode had been installed, I installed the PC board back inside the rig. You simply reverse the removal procedure. When tightening up the nuts on the switch shaft, don't get too carried away or you'll end up stripping out the threads and then you'll be in real deep dung! Finger-tighten them and then give them one full turn more.

Power up, and with the output of the rig into a dummy load, hit the tune position. Whoa! Works just like downtown! After all that messing around, to find out the problem was just a 10-cent diode takes it toll on the old self-confidence. Oh, well: One down and one (dead Argonaut) to go.

#### Another Argonaut Bites the Dust

This Argonaut is mine. I cooked it trying to find out what was wrong with the first one. Now, since I know the trouble was only a diode, what did I do to cook the other one? It's apparent the boards must be working correctly, but then again, look what happened the last time I assumed!

Since my Argonaut won't go into transmit, the likely spot to look for trouble would be the control board. The control board tells the other circuit board what to do and when to do it.

The control board is mounted on the top half of the Argonaut and almost directly over the meter and drive controls. It's a plug-in board with several trimmers mounted on it.

Since the control board does all the T/R switching, voltage checks on the "T" and "R" lines revealed that the "T" line was not going to +12 volts when the Argonaut was keyed. It then became a simple matter to follow the voltages as the key line was closed. After a few minutes of looking and checking, it became obvious the MPSU01 did not turn on and off as it should. Looking closer at the board and the transistor, it became quite clear why—the center lead of the transistor had broken off right at the component's base. You had to hold the board just right to see the broken lead on the transistor's body. It must have broken off while swapping control boards from one rig to the other.

Now, you can't just go down to the local Radio Shack store and get one of these critters, so a call to Ten-Tec provided me with the replacement part. In a few days they came in and within a matter of minutes the Argonaut came back to life.

#### Touch That Dial!

If you have to order parts from Ten-Tec, always include a dial cord kit. You can always use it yourself or give it to someone else who can use one. They're not too hard to install, but it does require a complete strip-down of the Argonaut. If you have to remove the end panels you may as well replace the dial cord while you're at it.

To get more life out of the dial cord

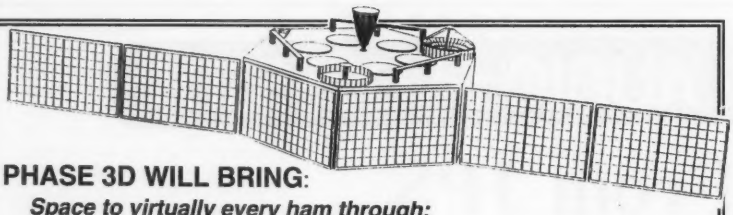

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*Photo A: The Ten-Tec Argonaut 509.*

when you're not using the rig, move the pointer all the way down to the low end of the dial. This removes nearly all the tension from the elastic cord, extending its life. As you move the pointer closer to the meter, you increase the pull on the elastic, thus weakening it. After awhile, when you move the pointer down to the low end of the band, the pointer will sag down into the window. At this point you'll have to restring the dial with new elastic cord.

If you made it to Dayton this year and did not get sick from the rain and cold weather, you probably were feeling well enough to pick up a used Argonaut. If you did, and you're still hoping that someday the other guy will send you the manual, you're in luck. You can get a complete manual for just about all the Ten-Tec rigs by calling their service department. You'll get a photocopy of the manual for about $20. Expensive, yes, but really worth the money when the Argonaut goes down.

**A Sneak Preview**

Dayton also provided a showcase for Ten-Tec to show off their new "Scout" transceiver. I'll have a full review in a coming "QRP" column, but here are some of the highlights of the Scout.

It's born as a monoband rig. You can change bands by swapping out a front panel plug-in module. The Scout will cover all the ham bands, including the WARC bands. Each band module costs $25. You get the band of your choice with the purchase of the rig. The band modules are about as long as a pack of cigarettes and about half as wide. The Scout will operate CW using the famous Ten-Tec QSK system, and of course it will cover SSB, too. Power output is 50 watts. Input power is rated at 100 watts. A QRP version of the Scout will be available down the road. The price will be about $50 less than the QRO version. You can turn down the power of the QRO version by adjusting the ALC control. Of course, the efficiency goes in the dumper, but you'll be able to operate QRP levels with the 50 watt version if you so desire. Current at full transmit output would be close to 9 amps. This current requirement can easily be met through the lighter plug in your auto. The CPU will demand up to 1 amp sitting there. I'll have a full rundown of the current demands when I get the unit in to do the full review. A small 10 amp power supply will be available as an option for the Scout. The Scout features a very easy-to-read LED display. I don't yet know if you can turn off the display.

QRM fighting controls include the adjustable Jones filter and an RIT control. There is an optional noise blanker to combat impulse-type noise. There is a built-in keyer included, too. A nice-sized combination S-meter and RF output meter round out the features of the Scout. First impression? Looks like a winner!

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### The W9TE Crossband ATV Repeater

I've been asked many times about the pitfalls and obstacles that need to be surmounted in order to successfully build an ATV repeater. This month I'd like to offer you the story of how members of the Fort Wayne Radio Club solved both the technical and political problems involved in installing a very effective ATV repeater, as described by Jim Pliett K9OMA. The following is his account.

#### Finding a Site

I (K9OMA) am an active ATVer with a few years experience operating simplex. I became intrigued with the idea of building an ATV repeater in the Fort Wayne area after seeing the Indianapolis ATV repeater in operation while attending meetings of the Indiana UHF club.

One day, while driving to work, I saw an empty tower at the Indiana/Purdue campus and wondered if there was any possibility of installing our ATV antennas on it. It was located right in the middle of the Fort Wayne amateur radio community and was nearly 170 feet tall.

Now, how does one deal with the politics of a state-funded community college to obtain permission for a repeater site? Lucky for us, one of our club members worked at the college and helped us gain a favorable position with the college board. Meanwhile, we set out writing letters to the National Weather Service and the Director of Emergency Preparedness describing how an ATV repeater could aid the community in the event of a disaster or emergency. We obtained letters of support from these organizations and presented them to the college board. After a few months of anxious waiting we not only obtained permission to use the tower but they provided us with an equipment room to boot!

We presented the idea of the ATV repeater to the members of the Fort Wayne Radio Club. We weren't sure we could sell the concept to a club that already supported two VHF repeaters and one UHF repeater, as well as sponsoring a large Field Day effort. However, since the club was recently solvent thanks to their last two successful hamfests (and probably thanks also to a few members who just wanted to end the meeting), the motion to fund the project was passed. Our first ATV repeater was getting closer to a reality!

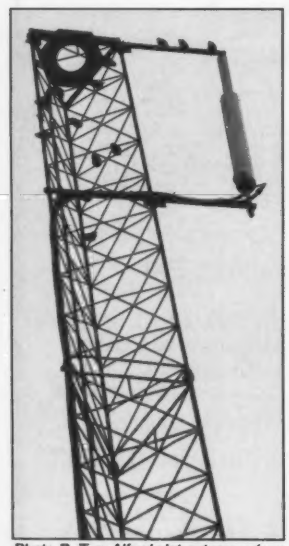

*Photo B. Two Alford slot antennas (one for 439.25 and one for 910.25 MHz) are stacked on top of each other and side-mounted on the tower. Birds just love it! (Photo by Jim Pliett K9OMA).*

#### Building the Repeater

Fortunately for us, Bruce WB8UGV had moved to the area from Dayton, Ohio. Bruce had a lot of experience with ATV repeater design since he built most of the original Dayton ATV repeater. We formed the repeater technical committee and started kicking around ideas. We have plenty of UHF voice repeaters in the area and a number of accomplished EME operators (K9KFR and AF9Y). Keeping in mind that we were the "new kids on the block" (along with Bruce's blood-curdling tales of in-band repeater problems on 440 MHz), we decided to go crossband with a 439.25 MHz input (lower vestigial sideband).

Now, did we want to go with an output on 1.2 GHz or 900 MHz? The 1.2 GHz band always seemed to be a good band, equipment was available, and the band was not threatened with extinction. However, could enough interest be generated to inspire lots of hams to go out and buy downconverters for that frequency to watch ATV? Probably not too many. A few visits to the local K-Mart and Wal-Mart stores provided us with an economical solution. The Gemini "Rabbit" wireless video system operated on the 900 MHz band and was available for under $50 (some stores sell just the receiver for substantially less). Not only do you get a high quality downconverter, but a transmitter is included as well. With the wide availability of these inexpensive units we decided to go with a repeater output on 910.25 MHz *[Ed. Note: Next month's column will describe how to install external antenna connectors on these units and tweak them up for best results.]*

*Photo A. The W9TE ATV repeater was on display at the Summit City hamfest just before final installation. (Photo by Jim Pliett K9OMA. The photographer can be seen on the TV monitor.)*

#### The Antenna System

Although vertical antennas are easy to obtain or build, we opted for horizontal polarization on both bands for added isolation from all of the nearby UHF repeaters that use vertical polarization and the services in the 900 MHz band that are also vertical.

Adolph WA9WTJ was given the task of designing and building a pair of horizontal omni-directional antennas (one for each band). Adolph decided to go with an Alford slot design, which allowed the antennas to sit on top of each other. Two- and four-inch diameter thin-wall tubing was obtained from local manufacturing companies and we found some scrap aluminum stock for the support collars. The radomes were built out of drainage pipe we bought at a farm store. To maintain the necessary accuracy for the slots, we had to hire a machinist. Since we had pretty much blown the budget by now, one of our members volunteered to machine the aluminum support collars.

#### Repeater Assembly and Installation

All of the hardware was tested and installed in the equipment rack. After some final tweaking and two revisions of the repeater controller's software, we were finally up and running with a working repeater (at least on the testbench). See Figure 1 for a block diagram of the final configuration of the W9TE ATV repeater. The 5-10 watt driver amplifier was built by Bob Johnson K9KFR. Although Bob used discrete components in this design, he recommends an easier approach using a new 10 watt linear brick amplifier that is now available from Down East Microwave, Box 2310, RR1, Troy ME 04987; Tel.: (207) 948-3741 (ask for the Hitachi PF0011 module).

The 100 watt amplifier is a Varian Eimac CV2810. These amplifiers are somewhat rare, but they turn up occasionally at hamfests or in surplus stores.

#### Success

At last the big day arrived. The club had amassed a 500-foot roll of 7/8-inch hardline for the installation. It was amusing to watch us try to wrestle with this giant coil of coax as we unrolled it and snaked it up two floors to the tower base. School regulations required us to dig into the club treasury to pay for a bonded tower climber, however. The antenna and coax was installed without a hitch. We opted to side-mount the antenna just below the top of the tower, hoping to be a lesser lightning attractor. A few days later we carried the repeater rack up three flights of stairs, hooked up the coax and fired up the transmitter. We were rewarded with a perfect 1:1 SWR (another perfect antenna design by WA9WTJ). Bruce WB8UGV headed home and sent the first picture through

the repeater. After overcoming a slight interference problem, we were fully operational!

After seven months of operation, we have experienced very few problems and have been off the air for only one day when an HV diode shorted out. ATV activity has been picking up in the region, with daily contacts being made through the repeater. During a band opening on May 9th, the repeater received a P4 picture from Andy W8AHY in Williamston, Michigan (150 miles away). That same night Jim W8AC and others in the Cleveland, Ohio, area worked through the repeater and saw the 910.25 MHz output at a distance of nearly 200 miles.

If you're in the area and would like to look for the repeater, you can bring up the video ID for one minute on 910.25 MHz by hitting a ***88** touch-tone command on 144.34 MHz. Hitting ***77** will hold open the repeater for continuous repeat mode (little or no input signal for weak signal reception) for one minute.

To recap, the repeater input is 439.25 MHz and the output is 910.25 MHz. Audio from the input video signal and anything received on 144.34 MHz will mix together into the repeater output audio subcarrier.

Next month we'll take a look at modifying the Gemini Rabbit for use on ATV in the 900 MHz band. *Thanks to Jim Pliett K9OMA for the above information.* 73

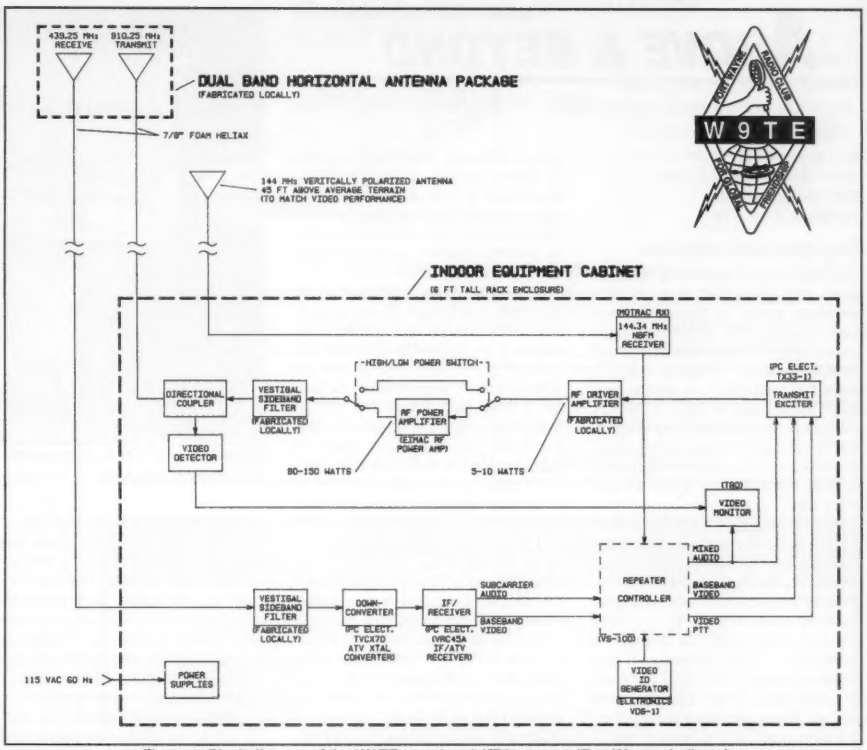


*Figure 1. Block diagram of the W9TE crossband ATV repeater (Fort Wayne, Indiana.)*


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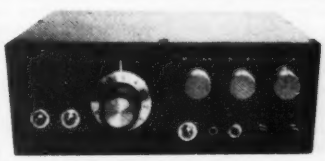

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### Solid-State Surplus Amplifiers

This month I would like to cover some little gems that have recently started to appear on the surplus markets—miniature RF amplifiers. These used to fall into the general category of "UNOBTANIUM." Regular readers know that unobtanium is usually relegated to the pages of defense industry microwave journals and very tough to find in surplus. However, these miniature RF amps are suddenly beginning to show up in surplus lots more and more often.

Perhaps the most outstanding feature of these little amps is their price tag—enough to make any accountant cough. But that does not detract from their beauty because they exhibit great gain and very low noise figures. They are especially attractive if they are found in the surplus markets and have frequency ranges that cover our amateur microwave bands. One drawback to note: These amplifiers are most often hermetically sealed, making modifications virtually impossible.

I have purchased quite a few of these amplifiers so I thought I would share some of the information that I have gained from the experience. When shopping for these devices you should keep in mind the old adage: "All that glitters is not gold." Take it from me, they are not all created equal. By that I mean some make very good doorstops. If you have a blown one, you can machine the top cover off to reveal a very interesting design structure (Photo A). Many of these have intermediate stages that still function but have no output due to a fried input or output stage. Some draw no current at all. So I must advise that you make a careful evaluation of unknown amplifiers.

For many of us, these amplifiers are real strange as far as their construction goes. They are assembled by microscope, using micro positioners. Never does even a small soldering iron touch their circuits—the amps are just too small. The circuitry is usually attached by miniature gold wire and welded by micropositioners. Take a look at Photo A. This is a picture of two amplifiers I purchased at local swap meets. For display purposes I have placed one defective amplifier, with its cover removed by a milling machine, on top of a good amplifier for comparison.

The amplifier that functions provides gain from 10.4 GHz to 18 GHz according to the manufacturer's label. But I tested it on my workbench and observed gain from 6 GHz to over 20 GHz with rolloff which was not too critical at those band edges. The remarkable thing about this amplifier is that the overall gain is 30 dB. Its maximum output power is also +30 dBm, with drive power of zero dBm. That means a standard signal generator can drive this amplifier to full output of +30 dBm or 1 watt power output. Still, this unit is so small it can fit in a flip-top cigarette box. They're quite miniature for the power and gain punch they pack. Please note that an external heat sink is required to operate these little amps.

Look at Photo A again. Upon close inspection, what appears to be large blocks centered about the direct line between the SMA coaxial connectors is actually very complex circuitry. Each small block is actually a complete push-pull transistor chip substrate circuit mounted in the space of a pencil eraser cross-section, way less than a quarter of an inch in area. A jeweler's loop or magnifying glass is needed to see this circuitry. You really have to see one in person to appreciate it. Then you can understand why they need a microscope to put these together.

### The Repair Job Learning Curve

One example of a repair job that proved interesting was on the mini-amp shown in Photo A., which I opened up after it drew no DC current. Upon investigation with a magnifying loop eyepiece I found a DC input lead broken. Attempts to re-attach it with a soldering iron were met with failure. Every time I tried to solder the gold wire it melted. I tried to re-connect it to the bypass capacitor that served as the connection post for the main DC power. I used a single strand of AC zip cord to terminate on the chip capacitor. It measured only 0.15" square but was still very large by comparison. My attempt to re-connect the gold wire failed, and trying to solder it with a 5 watt iron (my smallest) to the top of the chip cap was futile. What finally did work (for a while) was using two common sewing needles like chopsticks. I was successful in winding the gold wire around one single strand of zip cord.

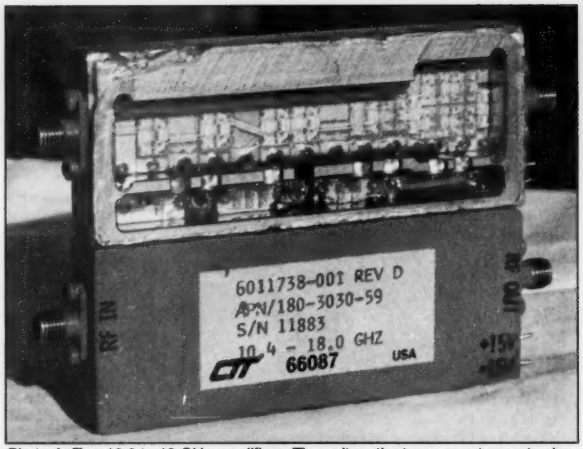


*Photo A. Two 10.6 to 18 GHz amplifiers. The unit on the top was cut open to show the assembly technique.*

After all this experimentation, the amp that was totally dead is now drawing current but still has an output stage failure. By checking with a probe and driving the input of the amp I was able to see gain increase by moving the probe from the input stage to successive stages. Now, this is an extreme case, but consider the learning experience. It proved to be a valuable lesson of how *not* to make a silk purse out of a sow's ear. All kidding aside, it was a valuable lesson and the information gained on how it was constructed alone was worth the trouble. Systems like these and how their various components work together are often valuable tools for discovery.

Let's look at another example. This one is also a tiny amp which uses SMA connectors and fully hermetic housings. The second amplifier is also made by CIT. It has a date code of 66087. I'm not sure what it all means but it seems safe to assume the "87" refers to the year it was made. While testing this amp, I found that with -10 dBm input power driving the amp I got +27 dBm output. That's a 1/2 watt of output power. I checked out the frequency range. It was from 4 to 8 GHz—exactly as written on the label. This amp rolled off fast at its band edges.

Increasing the drive until output compression started and then just backing off a tad produced an output of 1 watt at -1 dB drive. Higher drive levels took the amplifier into compression and produced no more output. DC power requirements were +15 volts at 1.3 amps. The amplifier is linear and capable of SSB, FM or even video if you want. What you put in is what you get out. You see a true reproduction with gain, just like a linear should give you.

What does something like this cost? Well, without the quantity price breaks, similar amplifiers sell for around $1,800. So, if you can't find one in surplus, they are available from the manufacturer. All you have to do is use some plastic credit and order one. I personally prefer to shop the surplus markets and wait for new toys to arrive. I paid $20 for the privilege to play with this one, without guarantees.

The packaging styles that I have just described are not the only ones to watch for, but they are an indicator of what may be inside. Take Photo B, for instance. It's an amplifier from Dexcel which was made to cover 8 to 10 GHz. I had no idea what this amp would actually do, but it's still a good example of what to look for. (It cost me $10 at a swap meet but came without a guarantee.) The first things to identify are the two SMA coaxial connectors, the single power connection, and the ground ter-

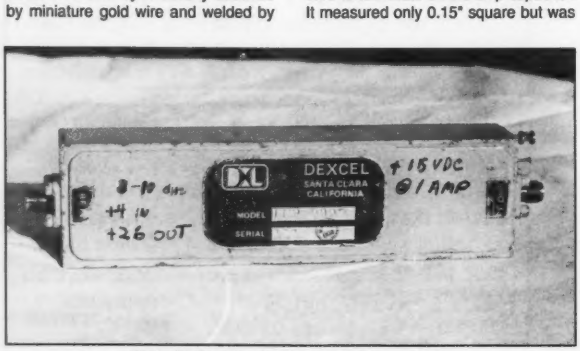


*Photo B. Sample of a Dexcel 10 GHz amplifier.*

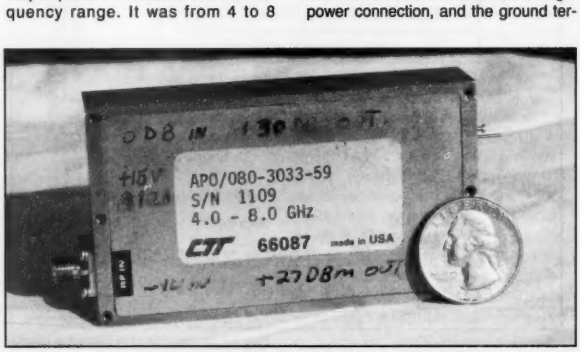


*Photo C. A compact CIT 4.0 to 8.0 GHz, 1 watt amplifier.*

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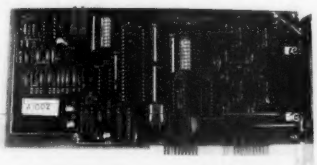

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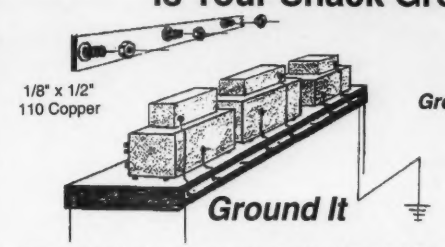


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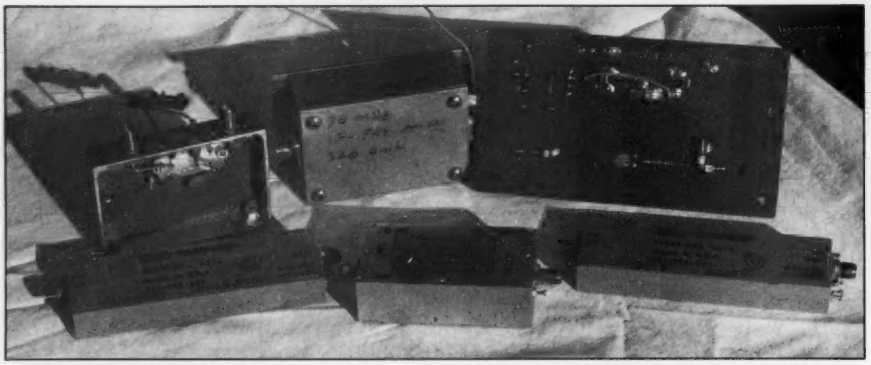

*Photo D. These amplifiers were purchased at a swap meet. Sometimes you can find treasure this way, but not always.*

minal. You have to figure these SMAs are costly connectors and for a manufacturer to use them indicates they expect high performance in the microwave range because they would not waste the money on low frequency stuff. More importantly, we know this is not a filter or some other "passive device" because they provide DC power feed through capacitors, one of which is marked "+15." My rational is: If it's not too expensive, give it a shot.

One thing to watch out for when evaluating surplus components is look-alike solid-state switching relays. They have *several* SMA connectors and *multiple* power pins. Don't confuse these with amplifiers! It's easy to make this mistake because many are not clearly labeled. For example, a solid-state switch (SPDT) would have three SMA connectors, one or two ground posts, and two DC power pins. (One power pin is required for each direction you bias the diode switch. One is positive and the other is negative or ground. This is to allow the common continuity to the diode that is normally positively biased on with a few mA of current.) But let's get back to RF amps.

There is some risk in buying surplus, of course. You have to have faith that the seller isn't testing them all and just selling those in better need of an autopsy. In this case, with the two SMA connectors, DC power connectors, and moderate price, I bought it. To test it I put it in my drill press bench vise, which serves as a heat sink, and applied +15 volts of power. It drew 1 amp of current. Driving with my sweep oscillator I was able to get just about 1/2 watt output with a few mW drive (+3 dBm). It was alive!

This amplifier was similar in many respects to the ones I mentioned earlier, except for size. This one was quite a bit larger, roughly 1" x 1" x 6". The point I want to make again is what to look for. The SMA connectors and power pins are the minimum requirements. Then you are on your own to evaluate what other information may or may not be marked on the prospective module you happen to be appraising.

In the case of this device, I figured out the power connector and found that when I applied DC power it drew about 1 amp. I then slowly increased the frequency on my sweep oscillator, keeping the drive level to -10 dB during initial testing. I found the output centered around the 8 to 11 GHz range. The amplifier had 22 dB gain with output power of about 1/2 watt throughout that frequency range.

Another unit that I picked up from surplus is the CIT power amp shown in Photo C. In this case, the label tells most of the story. With some units you just have to apply power and signal, but be aware that not all units will test the same. You just have to take the plunge and hope you didn't pay too much for these units. If the seller is asking for big bucks, inquire about the guarantee. If the dealer is reputable, you will be given a guarantee, or at least be allowed to test it before buying.

Testing before purchasing is a good option. It assures the purchaser that the unit operates, and also provides a good cover of protection for the seller. If a shop test is used the seller knows what is there and can prove it. With all surplus material, however, the guarantee is pretty much over at the end of the driveway. The seller is protected from someone abusing the unit or otherwise destroying it with reverse voltage in testing or some other unfore-


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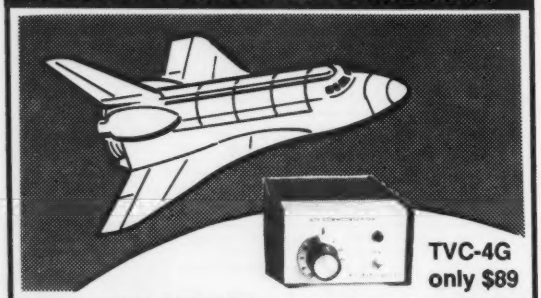

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seen event. This seems to be a reasonable policy if the parties to this transaction are not located too far from each other.

Let's go back to the amp in Photo C. In this case the amp had all parameters posted on the unit for frequency and polarity of DC power, but gave no clue of output power or gain. On the testbench I found that with -16 dB drive (input power) I could obtain 1/2 watt at the output. By raising the drive to near 0 dBm I obtained +30 dBm or 1 watt of output power before gain compression started. That's the maximum that the amp can tolerate, as it will give no further increase in output. This amp is tiny—I placed a quarter next to it for size comparison. The unit measures 3-1/2" x 2" x 3/4".

Power dissipated is 18 watts, so an effective heat sink must be used to keep the amplifier cool. If it is not used you will destroy the unit in short order. The preferred method is mounting it on a block of aluminum with heat sink grease. Note that in Photo C there are six mounting holes for attachment to a heat sink.

Photo D shows several amplifiers I purchased at a swap meet. The long-looking devices on the bottom left and bottom right are excellent doorstops. They were high gain 5 to 8 GHz units made by Raytheon for military application, but they showed very low gain and absorbed large amounts of power from the power supply (16 watts DC). I did not follow my general rule and got bitten on this one. I will have to have peanut butter sandwiches for a week or so to fully recover from this experience.

The other amplifiers in Photo D include a MIC amp (top left) for DC to 500 MHz, a 70 MHz IF amplifier with 32 dB gain (center top), and a homebrew 2 GHz amplifier of stripline construction. The bottom center unit is a 2.3 GHz amp, with 30 dB of gain, by Amplicia. The point in showing these is to highlight some of the various styles of amplifiers in use today. I wish you good luck locating some for yourself. Keep your eyes open at swap meets and other events. I have one friend who goes to swap meets with his wife and they snatch up everything they can find that sells for a buck or two that is small and has two SMA connectors and a power pin. True, he has an impressive collection of door stops. But so far they have only spent $10 on junk, and about $30 or so on real fine units.

Of course, the market is not limited to just amplifiers like these—they may be the exception. Other types are available; you just have to keep your eyes open. I have been able to pick up amps that work in the range of 30 MHz to several GHz. They are all usable—I use the low frequency amps for IF work and the higher frequency amps for RF work. If you are as lucky as I have been you will soon have more amplifiers than you can use. Your worst problem will be trying to store all this stuff. That's why I stress *small* on my list of requirements.

I violated this rule at the last swap meet when I found a unit that weighed over six pounds, heat sink included. It had a BNC and an N connector with power pins. The price was right, so I picked it up. It was covered with grimy dirt from the blower attached and lots of use. The label on top of the unit was obliterated and defied identification. The object on the heat sink was only 6" square and 1-1/2" high—very small for the heat sink it was attached to. I removed the basic unit from the heat sink and removed the 35 4/40 screws holding the top cover down. What I saw upon lifting the cover defied reason: It was a very complex microwave transmitter complete with oscillator.

After intense investigation I determined that this unit was a video transmitter converting video to RF directly. Internally it had two diplexers for two channels of audio to ride along with the video. Since it was about eight years old it used transistor frequency multiplication to about 1.7 GHz, where it fed a dual-channel, high-power varactor multiplier. The interesting part of this story is that when I applied 24 volts DC power, it drew 4 amps and put out +43 dBm at 4.9 GHz into a dummy load. Power of +43 dBm is 20 watts of power! Looks like the unit is good from 4 to 5 GHz so plans are in the making to see if it can be adjusted to the 5760 ham band as a video transmitter. What else can you say but, "WHAT A GOLD MINE!" It doesn't happen all the time, but sometimes it does happen. Now if I can only figure out the lottery numbers . . . just dreaming.

**Mailbox**

Jack N7OO, of Serria Vista, Arizona, wants to use 10 GHz full-duplex on a data link for experimentation. He has several intruder units manufactured by Raycom to test. His transmit units run on 78 volts DC. Can these units be modified? Well, Jack, it sounds like you have an Impatt diode oscillator, indicated by the 78 volts. That's what these diodes take for operation, 75 to 100 volts DC. Each diode has a specific critical voltage to set oscillation current—limited to a particular mA value for that diode.

Some units have to be adjusted lower in frequency by metallic screws penetrating further into the cavity. I have seen some Impatt sources that require dielectric tuning screws which have to be inserted into the cavity to do the same thing. In that case we used a Nylon 10/32 screw to do the required tuning. A little experimentation is needed to solve your particular unit's frequency adjustment. I just have not seen these Raycom units.

Well, that's it for this month. Next month I plan to get into another type of amplifier, the Log Amp. As always I will be glad to answer any questions relating to this or other aspects of VHF-to-microwave operation. Please send an SASE for a prompt response.


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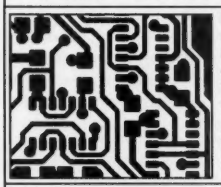

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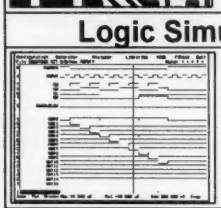

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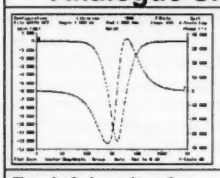

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| PD-900N | 902-928 Mhz | " NO | FM | 1/2W = 10W 65 |
| PD-900N | 902-928 Mhz | " NO | FM | 1/2W = 10W T/R 90 |
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### The End of Oscilloscopes

For the past couple of months, we've been examining the nitty-gritty of using that wondrous window into the wacky world of electrons, the oscilloscope. Let's finish it up.

#### Just a Short Delay

OK, you've got your waveform frozen on the screen. Great! You're all ready to go. Hmmm, the part you want to see is awfully small and squashed. Wouldn't it be nice if you could stretch it all out? Well, sure, you can speed up the sweep, but it's kind of annoying to have to switch it back to where you were after you're done. For quick time base increases, most scopes have a "time base magnification" button. This multiplies the speed of the time base by 10 (or sometimes by 5, depending on the scope) and lets you return to your original setting just by pressing the button again.

Uh oh, wait a minute, now the part you want to see is off the right side of the screen, lost in space somewhere. How do you get it back? Slow the sweep back down. But now everything's so scrunched together that all the detail is lost again; it's just a tiny blur and you're right back where you started. It would seem like there's no way out of this dilemma, but there is. It's called *delayed sweep*.

What you really need here is to trigger on your selected trigger point but not start sweeping until later on in the waveform, right? Delayed sweep lets you do that. First, you set up your waveform so that what you want to see is on the screen, but too small. That way, you know you have a stable trigger point. Then, you use the delayed sweep controls, which are just like the main time base controls, to start the sweep later in the signal. The effect is like looking through a magnifying glass. As you turn the sweep delay control, the signal zooms past as if you had a really long screen. Any time you work on a signal whose period of repetition is very long compared to the high frequency components (again, a TV signal is a great example), delayed sweep is an absolute necessity. There are lots of low-cost scopes that don't include this handy feature, but I strongly recommend you get a scope that has it, even if you don't see a need for it now. You will, I promise.

#### Cursors

Some newer scopes provide on-screen cursors which let you select various points in your waveform for measurement. You can, for instance, easily measure the time between any two points or select a point and read its voltage. Usually, the result is drawn numerically right on the screen. Although these cursors don't give you anything you can't get yourself with a little more work in interpreting the screen, they speed things up and take some of the burden off of you. They're nice but unessential. And they usually add a few hundred dollars to the price of a new scope.

#### Memories . . .

Light the corners of my workbench. Well, not *my* workbench, but some people's, especially if they have a fair amount of money. I'm referring to digital storage, which, for some applications, provides the ultimate in oscilloscope utility.

Digital storage scopes have been around for many years, but they still are too expensive for most of us. I've never seen one at a hamfest, either. (But I keep looking!) Digital scopes work in the same way as any other digital recording devices. They use an analog-to-digital (A/D) converter to digitize the incoming signal. Then they store the bits in memory. After that, the information is read out and displayed as a trace on the screen. Why bother? The beauty of the system is that you can do things to those bits while they are in memory. You can measure the values they represent, perform mathematical operations on them to remove noise, or do just about anything you can imagine. Also, you can keep those bits as long as you like and even store them on a disk without any signal degradation. And, your input signal can be a one-shot event and you can still see it long after it's gone! Sounds like electron utopia, huh? Well, not quite . . .

#### A Mess By Any Other Name

In order to accurately represent a signal in digital form, you have to sample it at a rate that is at least twice as fast as the fastest component of the signal itself. This basic tenet of sampling theory, called the Nyquist Rule, is the reason why compact discs sample at 44.1 kHz (because the highest audio frequency of interest is 20 kHz). It is also the reason why digital sampling devices always have low-pass filters at their inputs to reject any incoming signal components which are faster than half the speed of their A/D converters. It's absolutely necessary to do that because, if any of the unwanted signal frequencies get through, they will cause incorrect A/D conversion and result in an odd form of signal distortion known as "aliasing." Aliasing is the electronic equivalent of the strobe effect. You've seen that any time you've watched TV or a movie and seen car or wagon wheels appear to go backwards. The wheels were going much faster than the frame rate of the sampling device (TV or movie camera), so portions of their rotations were missed between frames. The result is that the wheels' positions were depicted at various points along their paths, implying a speed or direction of rotation which never really occurred. That's aliasing, and it can make an electronic signal appear totally different than it really was.

#### Equivalent Is Not Equal

On a digital scope, the limiting factor in the instrument's ability to "grab" fast signals is the speed of its A/D converter. Just a few years ago, an A/D converter which could digitize megahertz-rate signals was prohibitively expensive. We're talking hundreds of dollars here, just for the converter. So, in order to make commercially viable digital scopes, designers turned to a compromise method called "equivalent-time sampling." In this technique, the converter is made to sample a small piece of the signal which has been frozen in a preceding circuit called a "sample and hold." Each time the signal repeats, the converter samples the next small chunk, building up a digital representation of the total signal over many periods. This method of using a sluggish converter to digitize a fast signal does work, but it has a big disadvantage: The signal must repeat, and be exactly the same, over a fairly long period of time or the resulting digital representation will be wrong. So, equivalent-time sampling works fine for simple things like sine waves, but it is useless for complex waveforms which change a lot, like TV signals or digital pulse trains. Still, it is handy.

These days, 20 MHz converters are fairly cheap, and even faster ones are coming down in price all the time. So, a true-sampled 10 MHz scope is not prohibitive, and that same scope can offer equivalent-time sampling to perhaps 50 MHz or more.

Because of the aliasing issue, digital scopes take more understanding to use than do analog units. The only way to be sure you're really seeing the truth is to have some idea of what *should* be there in the first place!

Some scopes offer both digital and analog modes in the same box. They ain't cheap, but they offer the best of both worlds. Ah, if I only could afford one . . .

#### The Future

Considering the proliferation of pocket LCD TV sets, you might wonder why you can't buy a pocket LCD oscilloscope. Well, you can! That is, if you have some serious bucks. I've seen ads from two companies making them. One sells for about $1,100, and the other, with more speed and features, goes for about $2,000. As E.T. said, "Ouch." I strongly suspect that, if more people knew how to use scopes, the market would drive the price down and we'd see $100 basic LCD scopes at Radio Shack, just as once-exotic digital multimeters can now be had for as little as $25. I know I'd be first in line to get one.

Also, there have been several "computer scope" products which allow you to use your personal computer as a scope. These boxes contain the A/D and other required hardware and present digitized information to your computer, where application software lets you manipulate and display it. It's a great idea. About six years ago I had a computer scope made by Heath. It worked great but I strongly disliked using it, primarily because it used a serial interface at 9600 baud, resulting in slow, snapshot-like traces on the screen. Also, it had a slow A/D and relied heavily on equivalent-time sampling. A good, fast, converter and a parallel or SCSI interface would have made all the difference. Still, it was a useful, if frustrating, box.

Well, I think we've covered just about every knob and button on an oscilloscope. I hope I've enticed you to think about getting a scope, or to pull that dusty one out of the closet and fire it up. Now, let's look at a few letters:

**Dear Kaboom,**

My KDK FM-2033 transmits but does not receive. After awhile it comes back to life and works fine. I checked for bad solder joints, but no luck. I don't have the manual, and KDK is no longer in the US. How can I fix this thing?

**Signed,**
**At A Loss**

**Dear At,**

I'll bet if you measured the frequency of the rig's transmissions when it is not working, you'd find they were nowhere near where they should be! My bet is that your PLL is way out of lock and, for some rea-

son, the rig's out-of-lock detector is not catching it. It could be as simple as an adjustment, but I can't suggest anything because I, too, have no access to a manual for that rig. I strongly recommend that you put a notice out on packet and try to get a manual. Good luck—I hope you find one.

**Dear Kaboom,**

About five years ago I bought a Molicell rechargeable-lithium battery pack for my ICOM handheld. I still have it and it still works great! I once left it for six months and it retained about 85 percent of its charge. It seems to have no memory problem and is trouble-free; it's much better than NiCds. I'd like to buy another one but the supplier seems to have disappeared. What happened to this excellent product?

**Signed,**
**Unrequited Love**

**Dear Unrequited,**

I remember the Molicell. In fact, somewhere I still have a key chain the company gave me at a product demonstration. Yes, they were great batteries. Unfortunately, they were quite a bit more expensive than NiCds. I don't know if that's the reason they didn't catch on, and I don't know if Molicell is still in business or not. I do know that Sony has a rechargeable-lithium battery on its latest high-end mini camcorder, so the technology is not dead. If any of you out there know the status of Molicell or their wonderful batteries, please let me know and I'll pass it along here in the column.

Until next time, 73 de KB1UM.


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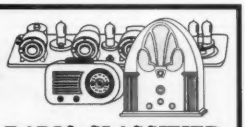

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## Notes from FN42

*Hey, guess what! Someone has been reading my column and told me the other day that he was taking my advice to get involved with helping others in ham radio. But, this guy has been very actively involved already. Gary KD1JR got involved from the very beginning of his amateur career, which hasn't been very long. He progressed through to Extra within a year and has been going hard ever since. And, not too long ago, he decided to get involved in the MARS program to be able to provide phone-patch service to many of our service people. Thanks, Gary, and keep up the good work! There's lots more news this month, so let's get to it! 73—Arnie, N1BAC.*

### Roundup

**Brazil** This is a little bit late, but *The Antenna-Electronica Popular* magazine sponsored the World Wide South America CW Contest—WWSA/1993 June 12-13, 1993. Send your logs (with SAE/IRC for results) by July 31 to WWSA Contest Committee, PO Box 282, 20001-970 Rio de Janeiro, RJ, Brazil. The WWSA CW Contest was created in 1982 and takes place every year on the second complete weekend of June. The WWSA is supervised by the well-known CW Groups Pica-Pau Carioca (PPC) and Morse Clube Gaucho (MCG).

**Republic of Korea** *Letter from Charlie R. Hopkins HL9FY:* Hello to all! I am stationed at Osan Air Base with the United States Air Force. We have a very active amateur radio club, the American Amateur Radio Club of Korea. We have members who attend our meetings from all over the Korean peninsula. I am the treasurer of this organization and the volunteer examiner coordinator liaison for the ARRL testing group. I have been in Korea this time since December 1987 and am currently serving on my seventh tour. I got my original amateur radio license in May 1983 and came to Korea in August 1983. Shortly after my arrival, I requested a HL9 callsign. Prior to my departure from the U.S.A. in 1987, I wrote to the office responsible for issuing licenses to U.S.A. personnel in Korea and was fortunate enough to get my old callsign back, HL9FY. I wish to inform you that some people coming to Korea can get an amateur radio license. There are some requirements to be met. Before a person is eligible to get a HL9 callsign, they must be covered under the Status of Forces Agreement (SOFA) between the governments of the United States and the Republic of Korea. If they meet this criteria and have a valid U.S. callsign, they can apply for an operator's permit and get a station authorization.

Operating in Korea is a little different from operating in the U.S. There are no portable or mobile operations permitted for HL9 licensees. There are no (repeat, *no*) CB operations allowed in Korea for foreigners. Furthermore, the installation of radio equipment (amateur or CB) in a privately-owned or government vehicle is prohibited.

The frequency allocations are different on some bands. Power is limited to 500 watts for the Extra, Advanced, and General Classes; 100 watts for the Technician Class; and 50 watts for the Novice Class. Just about all modes of operation are permitted: SSB, CW, RTTY, packet, SSTV, FM, and beacons, just to name a few. You must also maintain a log of contacts. A license, once issued, is valid until the

*Photo A. The Young Operators' International Club's logo.*

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person's DEROS (date of estimated return from overseas) is reached, the individual's stateside license expires, or the person leaves the country on a permanent change of station (PCS). If a person reaches his DEROS date but is extended, he or she must renew the license before the expiration date. The license date is not automatically extended with the service commitment extension. Any person coming to Korea who is covered by the SOFA agreement and would like more information on amateur radio operation may contact either myself or Mr. Andrew Lamb at the following addresses and phone numbers: SMSgt Charlie R. Hopkins, PSC #3, Box 5314, APO AP 96266-5314, 011-82-333-661-4750 (2300Z-0700Z), 315-784-4750 (DSN), 011-82-333-661-4620 (24 hour FAX), 315-784-4620 (DSN FAX) or Mr. Andrew F. Lamb, ACofS J6, ATTN: EAIM-O-OMT, APO AP 96205-0010, 011-82-2-7915-4160 (2300Z-0700Z), 315-725-4160 (DSN), 011-82-2-7913-3052 (24 hour FAX), 315-725-3052 (DSN FAX). Mr. Lamb or I can answer anyone's question(s) concerning getting a license in Korea. Please feel free to call or write if you need information. The phone numbers are listed as they would be dialed from a commercial phone, unless indicated as DSN. If you write, please note that an APO address is just like a stateside address and does not require international postage. Usually a three-to-four-page letter will only require one 29-cent postage stamp.

On a final note, a person may not apply for a HL9 callsign until they are physically in the country. So, if you are coming to Korea, pack up your rig and plan on getting on the air when you get here. A license can be processed in as little as 15-20 minutes. *[Wouldn't that be nice here in the U.S., rather than 6-8 weeks or more?—Arnie]* Andy and I are looking forward to hearing from the future HL9s and welcome you to "Korea: Land of the Morning Calm." 73 from Charlie HL9FY, AARCK Treasurer, AARCK ARRL VE Liaison.

**Russia** *Letter from Andrei Trubachov UA3PIP, organizer of YOP:* The Young Operators International Radio Club (YOP). The YOP is an international organization of young people, intended to promote friendship and a better understanding of one another by sharing ideas about radio and other hobbies through radio communication and a newsletter.

The idea of organizing the club came to me after about five years of activity on the ham bands. While trying to improve my English by talking with other operators, I found that about 95% of them were over 40 years old, particularly on CW, where after a number of contacts I began wondering if radio was just a place for retired people! This age difference is probably one of the reasons why the young guys I met became such good friends.

So, why not try to bring young hams and SWLs together through an international radio club? This would be a good opportunity for them to communicate, since many have VHF-UHF licenses or only receivers. Also, the boys and girls who are not yet licensed and are trying to get into amateur radio would be welcome to the club. A newsletter or small magazine will be published so that members may share their ideas about radio, as well as other interests, including computers, travel, music, etc.

So, if you are under age 30 and enjoy ham radio, join us and let's have fun together! Send your photograph and a brief description of yourself to: Mike Pagel WB9QFW, University of Wisconsin, Stevens Point, WI 54481 U.S.A. *[Andrei "Andy" Trubachov UA3PIP, 301264 Russia, Tulskaya Obl. Lipki, UL Gagarina 10, K. 14]*

## HONG KONG

*Phil Weaver VS6CT*
*Flat 39C Two Park Towers*
*1 Kings Road*
*Hong Kong*

Eric Lee VS6EL, a keen and enthusiastic amateur since 1977, is up and leaving for Australia. By the time you read this he will have set up home in Sydney. We are sorry to see you leave us, Eric, but wish you well in your new home and hope that we shall be hearing from you when you get on the air soon.

Christmas is behind us and both clubs had excellent Annual Dinners. As a result, talk is already in progress about next year's dinner. It was noted that perhaps we might have a joint Annual Dinner, but at a recent meeting of ELARCS it was felt that, as this is the only major social event of the year, and because we did not wish to lose our identity, the vote was all in favor of retaining our existing arrangement. We have already made a booking for the first weekend in December at the Royal Hong Kong Yacht Club again. This does not mean to say we would not wish to have a joint annual event. It was suggested for further discussion between HARTS, JAROC.NH, and ELARCS that perhaps a Spring Chinese Dinner might be the way to go in 1994, without chasing door prizes but just to have a pleasant social gathering of all the various elements of amateur radio under one roof. If you, our readers, have any ideas or proposals in this matter, please approach your club committee members with your ideas.

## ISRAEL

*Ron Gang 4X1MK*
*Kibbutz Urim*
*D. Negev 85530*
*Israel*

Hi to all. The June issue of *73* marked the tenth anniversary of the publication of my first contribution to "73 International." Amazing how fast those years have breezed by and how the scores of my contributions have added up. Going through the back issues shows how much ham radio has


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developed in my country in so many different areas. I don't know for sure, but I would hazard a guess that I'm your most veteran Hambassador still appearing regularly in the column without a break.

For the record, I am 43 years old, married with one child, an electrician by trade, have been a farmer, and still participate from time to time in the agricultural ventures of my kibbutz. I've held a ham license since 1965, RF being a long-term addiction that I have not succeeded in shaking. I've dabbled in many facets of the hobby over the years, including 160 meters DXing and general HF Dxing and ragchewing, and built all my own antennas. My latest interests in the hobby are satellites (mainly OSCAR 13) and VHF packet. I am also an artist, with paintings mainly, but not exclusively, celebrating the plains of the western Negev region of Israel. Some of these paintings may be found in private collections in Israel, Holland, the U.S., and Canada.

From time to time a reader will write me with a specific request for information or with a desire to set up a sked. The demands of a busy, working life do not allow me to accede to all these requests as time is a very scarce commodity. However, over the past 10 years I believe that I have covered almost every facet of Israeli amateur radio, and looking up the back issues of *73* will provide most of the answers.

## OKINAWA, JAPAN

*David Cowhig 7J6CBQ/WA1LBP*
*AmCon Naha*
*FBU PSC 556, Box 840*
*FPO AP 96372-0840*

The China Radio Sports Association strongly encourages home-brewing by Chinese hams. One enterprising Chinese ham in Shandong Province found a pre-1949 ham radio book and built a working, but unfortunately chirpy, two-tube transmitter with which he worked Chinese and foreign stations. Unfortunately, the parts, the test equipment and the level of these beginning Chinese home-brewers are not good enough to build home-brew equipment which meets the strict Chinese signal stability and bandwidth requirements. A *CQ Taiwan* ham magazine article concludes that once Chinese hams are able to buy fairly simple transceivers, their persistent efforts to learn foreign languages and CW will put them in touch with hams worldwide. The author predicts that Chinese ham radio will one day be as flourishing as Japanese ham radio.

Sending Chinese hams copies of some of the best home-brew construction articles which have appeared in US, Japanese, and other ham magazines is one way foreign hams can help. The language barrier and the difficulty of adapting a design to locally available parts are obstacles to the Chinese home-brewer, however. Perhaps Chinese magazines could reprint some of the best articles from foreign ham magazines if reprint permission could be arranged.

There is now no national ham magazine in the PRC. One very popular radio and electronics magazine, *Wuxiandian [Radio]*, published by the China Electronics Association and the Renmin Youdian Chubanshe, does devote a few pages to ham radio each month. The address is *Wuxiandian*, Dong Changan Jie 27, Beijing, China. Perhaps ham magazines outside China could arrange with *Wuxiandian*, and whatever other Chinese radio, electronics or ham magazines that will soon appear, to exchange permissions for non-exclusive translation and reprinting of articles without prior notification, just as *73* and the *CQ* Publishing Co. of Japan have done for several years. In this way, the Chinese magazine can make whatever parts substitutions and design changes are needed so that Chinese readers too can find the needed parts more easily and cheaply in their own area. A subscription to this Chinese language electronics repair technician oriented magazine can be obtained through the Joint Publishing Co., 9 Queen Victoria St., Hong Kong.

The China Radio Sports Association (CRSA) wrote the "Provisional Rules for Regulating Individual Amateur Radio Stations" at the request of the Chinese government to provide a framework which permitted the start of individual amateur radio station operation using the BA, BD, and BG prefixes on December 22, 1992. These rules provide that all hams shall be a citizen of the PRC of at least 18 years of age, that radio equipment meet national radio emission standards, that the equipment and station be inspected by the provincial or special municipality CRSA, and have proper documents from the CRSA when buying equipment, home-brewing or modifying equipment. The rules require on-air politeness, exchange of QSLs for international contacts, and forbid the use of amateur radio to promote business, political or religious activities. Amateur prefixes indicate license class: BA is for a First Class licensee; BD belongs to a Second Class licensee; and BG is for a Third or Fourth Class licensee. These new home ham stations are often home-brew and run low power. Listen for them!

## PEOPLE'S REPUBLIC OF CHINA

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*Room 316, Building 25*
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Hunter or Niu? Please note that I've changed my last name from Hunter to Niu, my real Chinese surname, in or-


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der to avoid getting you confused. I am Chinese.

TUARC SPECIAL EVENT '93 . . . Having received the formal approval from the State Sports Commission of China, TUARC is going to establish a special event station—BT2000BJ—May 23 through 31 and July 1 through 31. This somewhat different callsign is exclusively dedicated to showing our wholehearted support to Beijing's bid for the 2000 Olympic Games. We will mainly operate on the SSB phone mode (and also CW and RTTY) on practically all HF bands, including 12, 17, and 30 meters, especially 10 MHz CW. This might be the very first time "BT" is on the WARC bands. TWINS . . . Failure and Success are twins—this is exactly what we have learned from the recent antenna construction. With an outstanding book on hand and with Dieter/DJ7BU's professional instruction, we got a Zepp antenna built and working on March 20, but later the haphazard weather during this time of year caused some more trouble and crushed our well-designed, good-looking cubical quad on April 18. Thanks to Dieter's confidence and our perseverance, we quickly recovered and bettered the two old beams on April 25. Another dipole was getting the attention of passers-by on May 1, a real "Labor Day." The original ground plane will remain and we may put up an inverted V before the BT2000BJ Special Event.

CLASSROOM . . . The antenna is "everything" for working DX, but not everything for getting skilled ops to work DX. In order to get fully prepared for the high likelihood of pile-ups during the BT operation, Rick has started a 2nd session of the TUARC Amateur Radio Class and has gotten 15 more students involved. All of this group of boys and girls have a good command of English and a cooperative and progressive nature.

BT5HPW . . . Assisted by the Xinhua News Agency in Hong Kong, the Young Pioneers of China and the Hong Kong Girl Guides jointly started their North-American-Indian-type camp life in Hangzhou on April 5. A TS-50S and an AT-50 automatic antenna tuner were carried to the camping site, and the Special Event callsign BT5HPW remained busy on the air until the 19th of April.

LARRY AND JIMMY . . . Rick had a lovely chat April 30 with Jimmy BV4AS/7 and Larry BV7/N4VA, who were on their way to Penghu Island near Taiwan. Larry, as an American volunteer and the ITU Region 3 Coordinator, had just come back from his CW teaching in Bangladesh (S21). We wish Larry the best of good luck in whatever he'd like to undertake in the future and will look forward to learning Morse code from him sometime soon.

SUNSHINE COAST . . . TUARC is very grateful that the Sunshine Coast Amateur Radio Club (SCARC) in Australia sent out a quick response to our ham-related magazine request. Rick was happy to be informed by Ron VK4DRC and Joe VK4GEL that a package has been sent via surface mail. "ALMOST" HAM VISIT . . . While busy working a European pile-up on April 3, Rick heard, "Hi Rick. This is Ken G3OCA, and I'm flying to Beijing May 5." Ken did make the trip but, because of a temporary change of his tour schedule, we were unable to have an eyeball QSO. TUARC would like to thank Ken for the nice info and we'll see you next time.

Thank you for reading China Ham News. Any of your comments and/or suggestions are appreciated. If at any time TUARC can be of help to you, don't hesitate to ask. Remember that you have quite a few friends in Beijing.

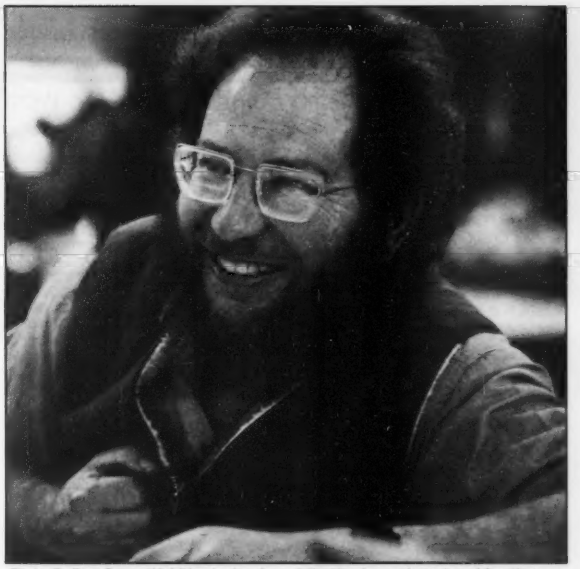

*Photo B. Ron Gang 4X1MK, who has been 73's Hambassador to Israel for 10 years.*


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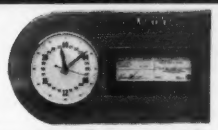
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# SPECIAL EVENTS

## Ham Doings Around the World

*Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check* ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

### AUG 1

**CROOKED LAKE, IN** The annual Land of Lakes Angola Hamfest, sponsored by the Land of Lakes ARC, will be held at Steuben County 4-H Park from 6 AM-1 PM. Talk-in on 147.180; packet: 145.090; 444.358-131.8 tone; 224.94 and 53.050 Angola Rptrs. Contact *Sharon Brown WD9DSP, 905 W. Parkway Dr., Pleasant Lake IN 46779. Tel. (219) 475-5897.*

### AUG 8

**MINERALWELLS, WV** The Mid-Ohio Valley ARC will hold their 5th annual Hamfest at the 4-H Campgrounds from 7 AM-4 PM. Talk-in on 146.745/.145 and 443.050/.550. Contact *Ron Ferrell WD8RGZ, (614) 423-5482*, or *Bill McClure WF8U, (304) 485-7777.*

**PEOTONE, IL** The 59th annual Hamfest/Computer Festival, sponsored by the Hamfesters RC, Inc. of Chicago, will be held from 8 AM-3 PM DST at the Will County Fairgrounds. Talk-in FM STARS and KARS Rptrs. will be used: STARS 146.64, KARS 146.94, and 146.52 simplex. Club call is W9AA. Contact *David F. Brasel NF9N, Hamfesters Radio Club, 7528 W. 109th Pl., Worth IL 60482. Tel. (708) 448-9432.*

**WHITE PLAINS, NY** The Westchester County Center will be the site for the American Radio Relay League—Eastern New York Section Convention. Sponsor: Westchester Emergency Communications Assn. Vendor spaces must be reserved in advance. Contact *WECAFEST '93, Jeanne Raffaelli N2NOY, 544 Manhattan Ave., Thornwood NY 10594. Tel. (914) 962-9666.*

### AUG 13-15

**VERNON, CT** The 19th Annual Eastern VHF/UHF/SHF Conference will be held at the Quality Inn (on the Hartford Turnpike). To get a registration form, write (with SASE) to: *Byron Blanchard N1EKV, 16 Round Hill Rd., Lexington MA 02173.* For room reservations, contact *Lori Tozier, (203) 646-5700.* Special rate available.

### AUG 14

**BURLINGTON, VT** The Burlington ARC will hold their BARC 41st Int'l. Hamfest at the Old Lantern Campground, Greenbush Rd., Charlotte VT. For camping info, call *(802) 425-2120.* Talk-in on 146.61/.01, 146.94/.34, 146.52 simplex. ARRL VEC Exams. For general info, call *David Berteau, (802) 893-7660.*

**RHINELANDER, WI** The Northwoods ARC, the Rhinelander/Tomahawk Rptr. Assn., and the ARRES, will co-sponsor a Swapfest at the Sugarcamp Town Hall (12 miles north of Rhinelander on Hwy. 17), from 8 AM-3 PM. VE Exams at 9 AM; registration at 8:30 AM. Talk-in on 146.94 Rhinelander Rptr.; also, 145.43 Tomahawk Rptr. For table info, write to *Glenn Woods N9GRF, 6569 Hillcrest Dr., Rhinelander WI 54501.*

### AUG 14-15

**HUNTSVILLE, AL** The 1993 Huntsville Hamfest/ARRL Nat'l. Convention, will be hosted by Huntsville Hamfest, Inc. at the Von Braun Civic Center, beginning at 9 AM both days. Talk-in by K4BFT will be on 146.34/.94. Contact *Huntsville Hamfest, P.O. Box 12534, Huntsville AL 35815. Tel. (205) 534-7175.*

### AUG 15

**CAMBRIDGE, MA** The MIT Electronics Research Soc., the MIT Radio Soc., and the Harvard Wireless Club will hold a Flea Market from 9 AM-2 PM at Albany and Main St. Talk-in on 146.52, and 449.725/444.725 - pl 2A - W1XM/R. Get details by calling *(617) 253-3776.*

**EASTON, PA** The Delaware-Lehigh ARC, Inc. Computer/Hamfest will be held at the Career Inst. of Tech. beginning at 8 AM. VE Exams. Talk-in on 146.70 W3OK Rptr. Contact *Bill Goodman K3ANS, (215) 253-2745 or (215) 258-5063.* Also call the *DLARC Answering Service, (215) 820-9110.*

**QUINCY, IL** The Western Ill. ARC will hold their Swapfest from 8 AM-2 PM at the Eagles Alps Lodge, 3737 N. 5th St. 1 mi N of US 24 and N 5th St. intersection. VE Exams. ARRL table. Talk-in on 147.63/.03, and 146.34/.94. Contact *Rod Simon N9MCX, c/o WIARC, P.O. Box 3132, Quincy IL 62305.*

### AUG 21

**ITHACA, NY** The Finger Lakes Hamfest will be held at the Armory Bldg., Rt. 13 and Hanshaw Rd. The Tompkins County ARC will host this event from 7 AM-3 PM. VE Exams - No walk-ins - Register by Aug. 3rd. Talk-in on 146.37/.97. Contact *Ross N2ISU, c/o T.C.A.R.C., P.O. Box 4144, Ithaca NY 14852-4144. Tel. (607) 257-3511.*

### AUG 22

**MARYSVILLE, OH** The Union County ARC will sponsor their 17th annual Marysville Hamfest/Computer Show at the Fairground in Marysville OH (near Columbus). VE Exams on a walk-in basis only. Contact *Don Sabins N8MGJ, 15704 Jolly Rd., Marysville OH 43040. Tel. (513) 642-0475.*

**ST CHARLES, MO** The St. Charles ARC will host Hamfest93 at the

*Continued on page 82*

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# HAM HELP

*We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full 8 1/2" x 11" sheet of paper. You may also upload a listing as E-mail to sysop, to the 73 BBS/Special Events Message Area #11. (2400 baud, 8 data bits, no parity, 1 stop bit, (603) 924-9343). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Specifically mention that your message is for the Ham Help Column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.*

Manual/Schematic? B&K 445, EICO 379, EICO 330, SEMCOR RC115, TS-888. *Marvin Moss W4UXJ, Box 28601, Atlanta GA 30358.*

I am a Grade 7 teacher and for the past three years have been teaching Ham Radio as an extra-curricular class for Grades 6 to 9. On May 2, 1993, our supply room was broken into and the majority of our radio equipment, which consists of VHF and UHF gear, was stolen. Because of our limited budget, this equipment cannot be replaced, and therefore, we are seeking donations of any type. Your help will be greatly appreciated. I will reimburse shipping and any other costs incurred. Please forward to *Jay Goldring, 327 Seneca Ave., Burlington Ontario, Canada L7R-2Z8.*

Wanted: Simple, inexpensive receivers or transceivers for 5.735 MHz USB, for 12 volts DC or less. Could be in kit form. Needed for use in Zaire, Africa for communication between churches. What are the possibilities? *Keith Gustafson KB0DRU, BP 1377, Bangui, Central African Republic, Africa.*

Can anyone provide me with schematics or manuals for the Gonset G-66B mobile receivers? I will gladly pay reasonable fees. *Al Cikas KA9GDL, 412 Radford Dr., Sherman IL 62684.*

Needed: Manual and schematic for a Tempo One SSB Xceiver. This is the Yaesu "white face" unit with transistorized VFO. I will gladly pay reasonable copy and shipping charges. Thanks and 73's. *Pretty Ogletree N0NMC, 3609 Bray Ave., Columbia MO 65203-0877. Tel. (314) 445-2662.*

I am looking for info, manual and schematics, for a D&A Maverick HF amplifier. I have been unable to contact the company. If you can help, please call *Jim Hassen KB3ANX, (301) 422-1209.*

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Blanchette Park, 6:30 AM-2:30 PM. Vendor area open 9 AM. Talk-in on 146.07/.67. Contact *Scott Schultz N0UVM, 241 Burning Leaf Dr., St. Peters MO 63376. Tel. (314) 928-7267.* VE Exam pre-registration: *(314) 524-3254.*

**TOWSON, MD** The 3rd annual Moose ARC Ham and Computerfest will be held 8 AM-4 PM at the Loyal Order of Moose, Towson Lodge 562. Talk-in on 145.330 and 224.12. Advance registration and info, *Nick Nickies WZ3J, (410) 668-2363,* or write: *Loyal Order of Moose, Towson Lodge 562, MOOSEFEST, 8801 Mylander Ln., Towson MD 21286.*

**AUG 22-23**

**ALBUQUERQUE, NM** The New Mexico Army Nat'l. Guard Armory, 600 Wyoming Blvd. N.E., will be the location for the Duke City Hamfest/ARRL Section Convention. Sponsors: The Duke City Hamfest and associated Clubs. Talk-in on 147.10 MHz Rptr. (+600 kHz), Rio Rancho K8BI. SASE to: *The Duke City Hamfest, P.O. Box 6552, Albuquerque NM 87197-6552.*

**AUG 28**

**CHAFFEE, NY** The PROS (Pioneer Radio Op. Soc.) will sponsor a Hamfest from 6 AM-5 PM at Manion Pk. Talk-in on 145.390 and 444.175. Contact *Paul Sumski KA2ZMC, P.O. Box 334, Arcade NY 14009. Tel. (716) 492-3198.*

**FREDRICKSBURG, VA** Call *AC4SK at (703) 373-7076;* or *AC4MB at (703) 891-5581,* for details about VE Exams to be conducted at the Central Rappahannock Library.

**GAINESVILLE, TX** The Cooke County ARC, Inc. will host its 2nd annual Ham Fest at the Civic Center beginning at 9 AM Sat. morning. Set-up Fri. Aug. 27th from 4 PM-9 PM and Sat. Aug. 28th from 8 AM-9 AM. VE Exams, all classes.

**GARDNER, MA** The 1st annual Flea Market to be sponsored by the Mohawk ARC, will be held rain or shine at Mohawk Drive-In Theater. Talk-In on 145.370 -600. Contact *Bill WJ1Y at (508) 939-2643.* Doors open at 0800 hrs.

**MANVILLE, NJ** The Somerset County ARS will hold its annual Hamfest at the Manville Civil Defense Bldg. at 60 Weiss St., starting at 8 AM. Talk-in on 448.175 (-5), 224.88 (-1.6), 146.53 simplex. Call *Ron Walkoviak N2RPK, (908) 685-1191, 6 PM-9 PM;* or *Pete Sepesi WA2OCN, (908) 722-2890, 6 PM-9 PM.*

**ROSEAU, MN** A Hamfest will be held by the Woods Rptr. Assn.,at the Roseau High School Gym, Hwy. #11 E., beginning at 10 AM. VE Exams. Talk-in on 147.69/.09 and 146.40/147.00. Reserve before Aug. 20th. Contact *David Landby KB0HAP, Rte. 3 Box 10, Warroad MN 56763. Tel. (218) 386-1092.*

**AUG 29**

**LEBANON, TN** The Short Mountain Rptr. Club will hold a Hamfest at Cedars of Lebanon State Pk., U.S. Hwy. 231, 7 miles S of I-40. Time: 7 AM-3 PM. Talk-in on 146.91. Contact *Mary Alice Fanning KA4GSB, 4936 Danby Dr., Nashville TN 37211. Tel. (615) 832-3215.*

**YONKERS, NY** Yonkers Municipal Parking Garage, on Main St., will be the location for the Hamfest/Computerfest being held by The Yonkers ARC, from 9 AM-3 PM. Talk-in on 146.865/R, 440.150/R, and 146.52 simplex. Get the details from *John WB2AUL, (914) 963-1021;* or *Jim N2ONM, (914) 969-5182.*

**SEP 3-4**

**ALOMOGORDO, NM** The Alamogordo ARC will hold its 9th annual Hamfest on Fri., Sep. 3rd, from 3 PM-9 PM; and Sat., Sep. 4th from 8 AM-2 PM. VE Exams will be held on Sat. at 9 AM for all classes; call *Ole Jorgensen WA5IPS, (505) 437-5896.* For Hamfest info, contact *Bill Leehan N5SUM, (505) 437-9781.*

**SEP 19**

**RAWHIDE, AZ** Thirteen local Amateur radio clubs of Phoenix AZ will sponsor a Family Amateur Radio Event beginning at 10 AM at a Pavilion in Rawhide. Loads of events. Talk-in on 146.76. For details, write to: *FARE, P.O. Box 9219, Phoenix AZ 85068.*

## SPECIAL EVENT STATIONS

**JUL 29-AUG 1**

**OSHKOSH, WI** Members of the Fox Cities ARC will operate W9ZL 8 AM-5 PM daily, from the Experimental Aircraft Assn. Fly-In and Convention (at the "Pioneer Airport" adjacent to the EAA Aviation Museum). Operation will be on the General phone portions of the HF bands, as well as RTTY and CW, as conditions permit. The Club will also be giving "on grounds" convention info on 146.520 simplex. To get a 8 x 10 certificate, send proper QSL and SASE only to *Wayne Pennings WD9FLJ, 913 N. Mason, Appleton WI 54914.*

**AUG 1**

**SKOKIE, IL** Members of the Orchard Village RC will operate N9HEL from 1600-2300 hrs., in the lower 25 kHz of the General 20, 15 and Novice 10 meter SSB subbands (depending on band conditions). Orchard Village is a residence for the developmentally disabled, and this station will give their radio club members (all studying for Novice class licenses) an opportunity to practice their skills, as well as demonstrate amateur radio to other residents and guests. For a QSL, send your QSL and SASE to *Gloria Beverly, c/o Orchard Village, 7670 Marmora, Skokie IL 60076.*

**AUG 7-8**

**LANNON, WI** Special Event Station W9WK, will be operated by the Milwaukee A.R.E.S., 0200Z Aug. 7-2000Z Aug. 8, to celebrate the 3rd annual "Picnic Ham" held at Menomonee Pk. Operation will be in the General phone and CW bands on 75, 40, 20, 15 and 10 meters. For a certificate, send QSL and a 9 x 12 envelope (with 2 units of postage) to *W9WK, c/o John Leekly, 757 N. Broadway, Suite 306, Milwaukee WI 53202.*

**MT. DAVIS, PA** The Somerset County ARC will operate NJ3T from the Highest point in Pennsylvania. Operation will be on the lower 50 kHz of the General class phone bands, on 10-80 meters as conditions allow. For a certificate, send QSL and SASE to *Jim Crowley NJ3T, R.D. 5 Box 223A, Somerset PA 15501.*

**AUG 13-SEP 6**

**ISLINGTON, ONT., CANADA** Station VE3CNE, Toronto, will operate 1400Z-0200Z, in conjuction with the Canadian Nat'l. Exhibition. Frequencies: Even hours: 14.015 MHz, CW and SSB; 14.150 MHz SSB listening; Odd hours: 7.020 MHz, CW and SSB; 7.075, SSB listening. For details and QSL response, mail to *VE3CNE, P.O. Box 307 Stn. H, Toronto, Canada M4C 5J2.*

**AUG 14**

**MIAMISBURG, OH** Members of the Mound ARA will operate W8DYY 1200Z-2200Z; the phone portion and Novice 10 meters, General portion of 20 and 40 meters, to celebrate the 175th Anniversary of Miamisburg. For QSL card, send SASE to *MARA, c/o Jeem Newland WB8RXI, 240 Carlwood Dr., Miamisburg OH 45342.*

**AUG 14-16**

**BENNINGTON, VT** The Southern VT ARC will operate N1JIF 1400Z-0500Z, to commemorate the Battle of Bennington and the 3rd Anniversary of SOVARC. Operation will be in the 80-15 meter General phone subbands and the Novice 10 meter phone subband. For parchment certificate, send QSL card, contact no., and a 9 x 12 SASE to *Micky Corrow N1JIF, RR2 Box 48, Bennington VT 05201-9537.*

**AUG 14-18**

**ST. PAUL ISLAND, NOVA SCOTIA** Members of the West Island ARC of Montreal are planning an expedition to St. Paul Island, and plan to operate Station CY9CWI in CW, SSB, and RTTY. Operations begin at 0000Z Aug 14 and will continue through Aug 18. Times are tentative. Frequencies: CW (MHz) 1.835, 3.505, 7.040, 10.120, 14.035, 18.105, 21.040, 21.120, 28.050; SSB (MHz) 1.840, 3.780, 7.205, 14.195, 18.130, 21.295, 24.490, 28.395; RTTY (MHz) 3.590, 7.040, 14.090, 21.090, 28.090. Address QSLs to the *West Island ARC, Inc., P.O. Box 884, Pointe-Claire/Dorval, QC. H9R 4Z6, Canada.* Address inquiries to *Fred Archibald VE2SEI, 130 Embleton Crescent, Pointe Claire QC. H9R 3N2 Canada.*

**AUG 14-22**

**KNOX, PA** Knox-area hams will operate KE3CN, N3IOP, W3MBD, and KA3WJJ, to commemorate the annual "Horse Thief Days Festival." Operation will be in the 40, 20, 17, and 15 meter bands, and 28.350 Novice. For a certificate, send QSL and SASE to *Gloria Barlett N3IOP, Box 12, Knox PA 16232.*

**AUG 18-25**

**CALGARY, ALBERTA, CANADA** The Calgary ARA will operate Station CH8MNP from Cameron Island (100 Kms from Magnetic North Pole) on 160-6 meters, all bands. Frequencies: 28460, 28560, 14260, 21260, 7060, 3760; CW, 5 up from bottom edge of bands. QSL to *CARA, Box 592 Stn. M, Calgary Alberta T2E 5J6, Canada.* Please include IRC, Canadia postage stamps or equivalent.

**AUG 20-22**

**SOCORRO, NM** The National Radio Astronomy Observatory ARC will operate Station NA5N for the dedication of NRAO's Very Long Baseline Array (VLBA), a continent-wide system of radio telescopes that will be the world's largest dedicated astronomical instrument. NA5N will operate from 1800Z Aug. 20-0200Z Aug. 21; and from 1800Z Aug 21-0200Z Aug 22, on 80, 40, 20, 15 or 10 meters, depending on propagation, in the lower portions of the General-class phone and CW segments. A special net including amateurs from the VLBA antenna sites and other NRAO observatories will be held at 1800Z Aug. 21st on 14.250 MHz. For QSL, send QSL and SASE to *NRAO ARC, P.O. Box O, Socorro NM 87801.*

**AUG 21**

**FRANKFORT, NY** Members of the Fort Herkimer ARC will operate AA2AT 1200Z-1800Z at the fairgrounds, in conjunction with the Herkimer County Fair. Operation will be on 10 meters Novice phone, lower portion of 15 meters Novice CW, and the lower portion of 15 and 20 meters General phone, per band conditions. For a certificate, send QSL and SASE to *FHARC, c/o Madeline M. Loiacano AA2AT, 342 Fourth Ave., Frankfort NY 13340.*

**AUG 21-22**

**SAN RAFAEL, CA** The Marin ARC, Inc. will operate W6SG 1000-1600 hrs. (PDT), from the clubhouse locations at Hamilton AFB and the San Rafael Red Cross, to commemorate the 60th Anniversary of the club. Operation will be on all bands, all modes, including the Novice subbands. Look for W6SG at the lower portion of each subband. For a certificate, send QSL and SASE to *MARC, P.O. Box 151231, San Rafael CA 94915-1231.*

**VANCOUVER, WA** Station W7AIA will be operated by the Clark County ARC to help the Northwest Antique Aircraft Club to celebrate the 34th annual Fly-In at Evergreen flying field, just East of Vancouver. Operation will be in the lower portion of the General phone bands; 40, 20, 15, with possible operation in the 10 meter novice band, and 75 meter band at night. For a certificate, SASE to *CCARC, P.O. Box 1424, Vancouver WA 98668.*

**AUG 21-23**

**ENGLEWOOD, NJ** The Englewood ARA, Inc. invites all amateurs the world over to take part in the 34th Annual New Jersey QSO Party. The contest is from 2000 UTC Aug. 21-0700 UTC Aug 22; and from 1300 UTC Aug. 22-0200 UTC Aug. 23. Get details from *Englewood ARA, Inc., P.O. Box 528, Englewood NJ 07631-0528.*

**AUG 27-SEP 6**

**N. SYRACUSE, NY** The Liverpool Amateur Rptr. Club will sponsor a Special Event Station at the 1993 New York State Fair. A morse code "test" for children will also be available, with a certificate earned for sending their name. Operation will be from 10 AM-9 PM each day, on Packet, HF, and VHF, in the bottom 25 kHz of the General phone and CW portions of 80, 40, 20, 15, and 10 meters. The station will be located in a 1910 Caboose owned by the CNY chapter of the Nat'l. Historical Railway Soc. Certificates will be sent for all contacts.

**SEP 1-6**

**MT PLEASANT, IA** The Mt. Pleasant IA ARC will operate W0MME at the Midwest Old Threshers Reunion. Frequencies: 3970 kHz, 7243 kHz, 14271 kHz, 147.39 (+600) and 444.950 (+5 MHz) Rptrs. For QSL, send SASE to *Dave Schneider WD0ENR, RR3, Box 307A, Mt. Pleasant IA 52641.*

**SEP 4**

**PANAMA CITY, PANAMA** The Radio Club de Panama will host "CQ Contest Anniversary Radio Club of Panama" between 00:01 and 23:59 GMT, on 40, 20, and 15 meters, to celebrate the 22nd Anniversary of the founding of the club. For details, contact *Radio Club de Panama, Anniversary Contest, P.O. Box 10745, Panama 4, Panama. Fax: (507) 26-4477. Packet: HP1COO@HP1XNE.#PANCTY.PAN.SA*

**SEP 5-6**

**AUBURN, IN** The North East Indiana ARC will operate N9JHF 1400Z-2100Z Sep. 5 and 6, to honor the Auburn-Cord-Dusenberg days. Operation will be in the lower 25 kHz of the General phone and CW bands, 40-10 meters. For QSL, send QSL and SASE to *NEIRC/ACD, P.O. Box 745, Auburn IN 46706.*

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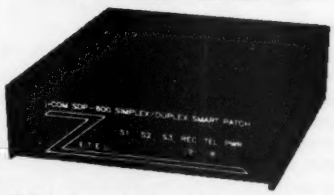

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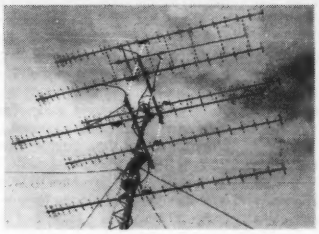

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*Continued from page 4*

mainly made equipment for the military.

I'd just started *73*, so this bomb almost put my fledgling magazine out of business. Worse, the ARRL proposed rule change also discouraged school radio clubs and almost 100% of them folded up.

That's when we lost our infrastructure . . . our main source of new hams. Up until that time 80% of our new hams had been teenagers, according to an ARRL study. Fifty percent of the newcomers were either 14 or 15 years old. Further, the study also showed that 80% of these newcomers went on to high-tech careers as a result of their interest in amateur radio. Thus, once we lost our source of new hams, our communications and electronics industries lost their major source of recruits. I don't know how much this contributed to our loss of consumer electronics industries to Japan, but there's no way this could have made things better for us.

So here we are in 1993. I'm not really sure what good reason there is for our hobby in today's world and as we are running it. We have little need for the Morse code any longer. We have little need for much in the way of electronics education since we are building little and repairing not. Thus, if our exams are going to be relevant to what we're actually doing, what kind of questions should be asked?

We do want ops to know the rules, even if many ignore or flaunt them. And we'd like them to know how to be good operators, even if their personal craziness keeps them from doing this. It would be nice if they had a concept of how our bands are laid out and how each one works. Perhaps we should ask that they have an understanding of how the various modes work . . . what FM and AM mean. How SSB works. How RTTY and SSTV work. How packet works. How to make satellite contacts. How repeaters work. Things like that. It could be helpful if they had an understanding of antennas and how to tune them. They might burn out fewer finals. And how about knowing how to tune receivers? And how to keep from turning up their compression control and messing up the band?

I wonder if we might be able to include at least a basic courses on how to talk, something that has been sadly needed for years? We've got rag-chewers who've been saying the same stupid things for years, without one ounce of brains showing through. Their rag is so thoroughly chewed it's about dissolved.

The code. Yes, I know we need some sort of filter to keep the good guys out and let in as many crazies as we can. The code has served this purpose admirably for decades. I see where an Extra Class licensee just had his ticket pulled for transmitting false distress signals. Two other Extra Classers were put in prison for bad language on CB. Another took a gun and shot his co-workers. Great filter we've been using. The only fairly sane Extra Class licensees I know cheated to get their tickets using the Bash system.

Yes, I know all about the ITU requiring a knowledge of the code for operation under 30 MHz. I also know that the ITU does not specify any speed, so we could just as easily let 5 wpm be the only code speed we check for all classes of license. The nice thing about 5 wpm is that you don't even have to be able to copy the code to pass a test at that speed. You can just write down the dots and dashes and then decipher them at your leisure. It doesn't take much effort to at least learn the code characters. I did it one night when I was 12 and was getting dressed to go to a Boy Scout meeting. Took maybe a half hour, tops, and I've known 'em ever since.

It doesn't take long to memorize stuff like that. I had to memorize the Greek alphabet during a fraternity initiation. That took maybe 10 minutes and I've known it ever since. Now and then it comes in handy. Handier than the code ever has.

### The Up and Down Sides

What would be the benefit of going to one class of license? Well, it would save a lot of money and a lot of aggravation. It would also result in our having a lot more hams. And that, in turn, would result in our having more political clout.

Oh, my God, think how crowded the bands would get! Maybe. On the other hand, we need some pressure to get us to use the 99.9% of our allocated bands which we are flat out not using yet. We also need some kind of pressure to get us to invent and pioneer some more spectrum-efficient modes of communication.

Oh, we moan and groan about 450 MHz being packed solid. Baloney. It's packed solid with little-used repeater links which could just as easily be moved to 10.5 GHz, where hundreds of them could all share one single frequency, using directional antennas to prevent interference.

We're busy fighting each other for DX, creating pile-ups and worldwide bad feelings. Some fairly simple digital techniques could resolve this mess in a hurry. For that matter, once we go digital, we'll be able to have our stations make DX contacts for us automatically in about a second and we'd be able to work all 400 countries in one day. This might even make it so those of us who have learned to talk might be able to enjoy actually talking with chaps in rare spots around the world.

I can hear the croaking chorus of oldtimers now. If we open the gates our ham bands will be as bad as the Citizen's Band. Only hams who have (a) not listened to our bands in several years and (b) not listened to CB in years could say such a dumb thing.

Of course I don't think I've proposed making the ham ticket as easy to get as buying a CB rig, so I doubt we're going to be attracting very many Southern truck drivers. But then here you are arguing with me about how bad this would be and you haven't asked me what I'm proposing in the way of a license test barrier.

I know it's unpolitic to even suggest that there are classes of people in America. Well, Vance Packard many years ago described different classes and did a good job of it. We do have different classes and they stay fairly separate. In fact, they are less flexible these days than they used to be a generation or two ago. It used to be much easier to move up in class.


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The classes are divided by language, kinds of homes, the clothes they wear, the clubs they belong to, the kinds of cars they drive, their furniture, the foods they eat, and so on. Hams, as I mentioned, tend to center on lower middle class, with almost no lower class people attracted to the hobby, and only a few of the upper middle class. We have a few doctors, lawyers, and business executives, but very few of these are particularly high-earners. Hams tend to center in the $35,000 to $65,000 family income range.

The positive side of this sociological excursion is that, being of a similar class, hams tend to be able to get along with each other easily. It results in our ability to talk about things of common interest during our contacts. We tend to have common backgrounds. If you've ever attended a major hamfest or convention you can see this . . . particularly when you compare the mix of people with a CB convention. Different group of people entirely. So it's no wonder hams tend to look down on CBers. We haven't completely eradicated class consciousness in America yet.

Taking all that into consideration we have a little problem for you to talk about and come up with some ideas. If we're going to continue to have a government franchised and supported hobby for middle-class white men we've got to find a way to justify our use of billions of dollars in public resources. We've got to come up with some solid reasons why the rich and the poor, and the other 99.6% of the middle-class, should fund our fun.

Please advise.

**Wayne Hates CW!**

Our CW religious fundamentalists will accuse me of hating CW. I don't hate it. I don't love it either. Do I have any other choices? Yes, I'm opposed to using a code test to keep people out of the hobby. We don't demand a typing test for new hams so we know they'll be adept at RTTY and packet and not have to sit there staring at their keyboard, trying to find the letter they want. We don't even ask newcomers to pass a spelling test.

CW is a fun mode and should be kept that. Those of us who enjoy batting out our conversations with a key should do it because it's fun. Instead we've made the code the biggest ogre keeping people out of the hobby. That's one way to make absolutely sure that few newcomers enjoy the code.

When I first started going to hamfests they all had code copying contests, complete with certificates. I'll always remember W2ECL, the local code champ, winning the contest at the Hudson Division Convention in 1938. He slaughtered 'em. I'll bet we can make it a matter of pride to be good at code by running competitions at hamfests and conventions.

**One-Class License!**

Other than giving up your ability to be overbearing toward those lower license classes, what have you against opening all of our bands to all classes of license?

What I'd like to see is a license issued by ham clubs to members who've demonstrated their knowledge of our rules, who have an understanding of the various modes available to us, and who have shown they know how to operate. You want to be a ham? Join a club and get some training.

Just as important would be the right of the club to take the license away if the member they endorsed does bad things. We make it far too difficult to delicense our crazies. A ham license is not a right, it's a priviledge, and it should be able to be taken away as easily as it's given. Make sense?

I'd rather see clubs handling these problems instead of lawyers and the courts.

**CW Again**

I got a letter from a nervous nelly who was afraid of appearing in print. It said, "I wish you'd quit picking on all us old CW operators! I've been a ham since I was 15 and still love CW and work it 90% of the time. My time on the air is half rag-chewing and half DXing, mostly on a band you don't like, 30 meters." My answer: Dear Nervous, as far as CW is concerned, I'll be even more supportive of it when you stop insisting on jamming it down everyone's throat just because you enjoy it. CW is a fun aspect of the hobby and should not be used as a weapon to keep out 90% of the kids we might attract out of the hobby. CW is fun, but it's like playing with antique cars in that it's a hundred-year-old technology and it's pathetically outdated.

**Japan Has 1.3 Million Hams!**

Not bad for a country with half our population. Now, if you think the ham bands are crowded here in America, wait'll you get anywhere near Japan! It's no wonder that they are leading the world in UHF pioneering. It's really amazing to look through the Japanese *CQ Ham Radio* and see all the fantastic experimenting and building they are doing. That's probably one of the reasons their electronics parts business is still going strong, while ours is long-gone unless you hit that mother of all junk piles, the Dayton Hamvention flea market.

When you visit Tokyo, if you're a ham you'll be heading for the fabled Akihabara section of town, where endless small shops are teeming with youngsters shopping for parts. It's even better than the old Cortlandt Street (NYC) shops, where I spent much of my youth . . . and my allowance.

Japan is going bananas over mobile radios. They had 5 million transmitters licensed in 1989, and have been increasing about a million a year since then.

**The World Direction Finding Championship**

185 hams from 23 countries gathered in Siofok, Hungary, last September to participate in the 6th World ARDF Championship contest. No, no one was there from the U.S. They did have participants from all over Europe and even from Japan, China, and Mongolia! It's pretty sorry that we Americans couldn't even field one crummy team for a world championship ham contest like that. I guess our clubs are too busy with business meetings to promote amateur radio as a sport.


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The 2m contest top places werewon by Ukrainia, Russia, Hungary, Czechoslovakia, and China. The 80m division winners were Ukrania, Russia, China, Germany, Hungary, and Czechoslovakia.

**A Dozen New Countries Announced!**

**DXers Have Group Nervous Breakdown**

You're going to like my sneaky plan for generating a whole bunch of new countries. Could eventually be dozens. Real new countries, too. How do I think these things up? And this brainstorm has the added benefit of not only generating billions of dollars in new business, but also saving the U.S. a bundle.

Let me start from the beginning and show you how this whole concept developed. It all had to do with the increasing pleas for the U.S. to support the disintegrating situation in Russia. Being a conservative and an entrepreneur, I'm a natural enemy of socialism and communism, so I'm not a big fan of giving money away. I'm in favor of the "teaching 'em how to fish" approach.

**Financing Russia**

Russia, to no one's surprise, is in one hell of a mess. Yes, it's a self-brought-on mess, so we're not terribly inclined to ante up now that they're passing the hat. Just look at the misery and expense the USSR caused the world over the last 50 years!

So here we are at a time when our Congress has already borrowed to the hilt to pay off lobbyists' demands for pork and entitlements. It's a really terrible time to see Yeltsin, tin cup in hand, begging to feed his starving family.

Russia, and the other ex-Soviet republics, are in awful shape. They haven't the infrastructure, the legal system, the banking system, or even a political system to help them cope with what's happening. Worse, the mess in Yugoslavia could well be just the beginning of a whole series of tribal wars.

I had an opportunity to go over to Russia and The Ukraine last year with a University of Virginia group to help teach them more about capitalism and entrepreneurialism. But without roads, communications, power, a business-oriented legal system, food distribution, and so on, I didn't see how I could really help much. The team, on their return, confirmed my suspicions.

Well, you've got plenty of sources for in-depth recitals of the problems facing the Soviet Republics. I've found *Foreign Affairs* particularly helpful, plus articles in *Forbes, Fortune,* the news magazines, and *The Public Interest.*

Yes, I've visited Russia. And the Ukraine.

Since the collapse of the USSR we're the only world superpower, which has for some reason been translated in many minds into America being responsible for solving all of the problems of the world. Not just those which pose threats to us, but those which pose threats to anyone. Methinks I detect another liberal agenda . . . another "let's tax everyone and spend the money to do a social good." And never mind that the recipients will probably end up hating us for it. We've never had much success with buying friendship.

**Buying Things Instead of Friendship**

A few years ago there was a call by the Russian ambassador for proposed solutions to the problems facing the USSR as communism collapsed and they were facing massive changes. I remember sending a letter with my proposal for solving their problems. I felt that the single most critical need for all the new republics was a stable currency. Russia, for instance, needed to make the ruble convertible. To do that they needed to back it with something which had acknowledged value. They'd already plundered much of their gold hoard, so there wasn't nearly enough gold left to back their currency. Worse, to meet the demands for military, bureaucratic, and state-owned business payrolls, the printing presses were cranking out tons of ever more worthless rubles.

I pointed out that the Soviet republics did have one very solid asset which could be used to back their currencies. The governments own almost everything . . . the land, homes, factories, the railroads, and so on. If the ruble, for instance, could be backed by the real value of these assets, it could become convertible. The value pledged would have to be internationally accepted for it to work.

Thus, if the government of a republic wanted to keep the ruble presses running, they'd have to pledge more and more of their assets to back the new notes. This eventually would have a chilling effect on the normal bureaucratic tendency to ignore inflation.

This would set the stage to make it possible for foreign aid to be sent in exchange for assets instead of mere gifts . . . loans, they're called. I know I'd feel a lot better about American loans to foreign countries if I knew we were getting something of value in return . . . something more than hate. At least then, when we pour more billions into the Swiss bank accounts of third world tyrants, we'd end up owning something.

But what about that inflation business? If we "buy" land at $50 an acre in return for lending money to a tyrant, what happens when the value of the land drops to $5 an acre? Unk screwed again? Nope, if we get good value for our "loans" we could care less how badly they inflate their currency. The property we get in exchange will hold its value.

**So Why Can't They Just Take It Back?**

The assets they're exchanging for "loans" will only be recoverable if they repay the loans . . . plus interest and the value of any improvements we've made, and with inflation factored in. What I have in mind is the actual ownership of any real estate or other property by the United States or any other loaning country, for that matter. This property would be ceded to us and thus be a part of America and not be subject to their laws or expropriation. Yes, this is a tough bargain, but if they want to borrow money we need to have some real security to guarantee its return (with interest), or something of real value in exchange. And none of this 99-year lease business which has come to haunt Britain in Hong Kong.

We sure could use some land for American military and business outposts in the countries we have been giving billions of dollars to. We'd also have to be granted access via air, sea, and land to our enclaves. Make sense? And each of these enclaves would obviously count as a new country.

The alternative of not getting our money is always there for the countries to choose.

Again, my perspective is from that of capitalism instead of socialism. The socialist impulse, which is so strong at times, is to take from the rich and give to the poor. Never mind why the people you're taking it from are rich or why the people you're giving it to are poor. Never mind that the poor spurned education, while the rich worked their asses off to be educated and then to be successful in their work.

It turns out that there are very few well-educated poor (other than teachers), and few uneducated rich. Teachers and bureaucrats, who tend to think in socialist terms, with disappointingly few exceptions, have their own self-made hell.

The capitalist approach is a quid-pro-quo. If you want money from me, what'll you give me for it? This approach could put a whole new spin on our incredibly generous loans to the socialist country of Israel. And don't you wish we'd ended up with more than a fleeting sneer of gratitude for our investment in Kuwait? As I've pointed out in the past, gratitude is one of the least felt and most transient of all human emotions. Isn't there a platitude about never lending money to friends? Well, it turns out that we never seem to.

I'd love to see an American enclave in Jordan in return for the billions we poured into that country. Hell, we'd own most of the south end of Israel by now if we'd bargained, and we'd be able to build our own settlements. We might even be able to open some schools and educate the Palestinian kids to beyond the rock-throwing stage of human development. On the other hand, we could have exported our dreadful public school system and made their situation even worse.

It's too late in the century to call this 20th century imperialism. We might call it 21st century capitalism. Just look at the success of Hong Kong, which is a good example of what I have in mind. And look at the mess they're in now that the colony is about to be returned to China. Another good example is Singapore. And Macau.

If we'd thought of this approach a few years ago we could by now own both Aqaba (Jordan) and Eilat (Israel), and have a prospering capitalist enclave on the Arabian Sea. This would have come in very handy when we wanted to cut Saddam off from the flood of food and munitions being imported through Aqaba and trucked to Iraq. I've personally seen the endless truck convoys involved in that operation.

And instead of just flat out giving alms to Egypt we could have expanded the Aqaba-Eilat enclave on down the Sinai Peninsula, making another Hong Kong or Singapore type of settlement.

So what have we now to show for the billions we've poured into Africa, Asia and the Middle East? Bupkis. All we've got is a bunch of people who owe us far beyond anything repayable, and who hate our guts. Am I exaggerating?

The next time Congress or the President get the itch to give away money let's try to talk them into getting something of value in return. Let's get them to think of investing instead of giving. This isn't a bad concept here at home the next time our liberals want to throw money at social problems. Let's consider how we can get something in exchange.

For instance, I've recommended that kids borrow money (with interest) to pay for their educations . . . starting from at least the first grade. They'll be a lot more careful in how they invest it and not be as likely to fritter their investment away. The same goes for unemployment payments and welfare. Instead of taking the money away from us in payroll deductions before we're unemployed, making us all feel as though this money is coming to us, suppose we made the payments as loans to the unemployed which would then have to be repaid from future earnings? Once repaid, the money would no longer be deducted from their paychecks.

But what about deadbeats? Their checks could start getting smaller when their total payments got out over a certain percentage of their most recent annual salary. Beyond that they'd have to report for work and do something. This crew could help keep streets clean, help in hospitals and nursing homes, and so on. We're not short of jobs that need doing that don't take a lot of education or experience.

You probably share the same feeling I do. When I eat out I'm paying for that roll and butter, so I eat it . . . even if I'm dieting and would never eat it at home. It's difficult to turn down something that you've paid for because it seems like it is free.

Hmmm, I seem to be getting off on a sidetrack again. But a good one. If Congress would insist on getting something of value in return for foreign loans there would be fewer of them and we'd at least end up with something in exchange for the taxes the IRS takes from us at gunpoint. We might even be able to make good money with our investments in overseas enclaves and thus eventually be ale to cut our taxes.

No, I'm not promoting 21st century imperialism. It's capitalism. Mercantilism. I don't see why any enclaves we get in exchange for loans would have to be run from Washington. They would not be conquered territory. They'd be bought and paid for. And, as we add value to the territories, their buying back would be more expensive for the selling country . . . which would be built into our purchase agreement. We don't need to see our investments expropriated by new tyrant-run or socialist governments.

Britain had similar arrangements with Hong Kong, Sarawak, Brunei, Sabah, Australia, and other countries . . . all of which I've visited . . . so I've seen firsthand how well this protective umbrella has worked.

So let's get busy and let our Congress know we're opposed to the old style of foreign aid giveaways. Let's stop just giving and making enemies. Let's use our help as a way to spread capitalism. That will, in turn, tend to spread democracy.

If Russia is in desperate need of a bailout, and if we really can afford to go deeper in debt to help them, let's find out what we can get in return. Someplace where we can start sewing capitalist seeds in an enclave that used to be Russian. How about a couple thousand or so acres up around Yvborg, on the Baltic Sea, not far from Helsinki and St. Petersburg? That would be a great spot for a capitalist enclave, and it would tend to help the Russians in their conversion to capitalism. I'll start packing a rig to put it on the air.

Now, what other countries are in that line for U.S. handouts? 73

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So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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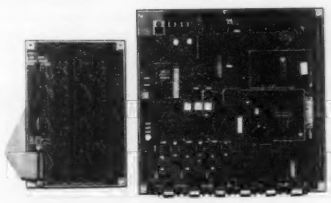

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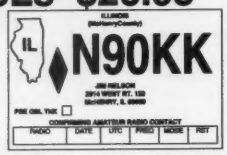


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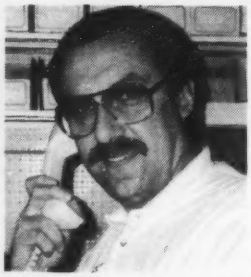

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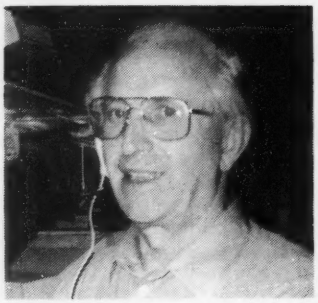

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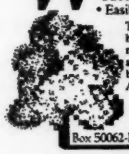

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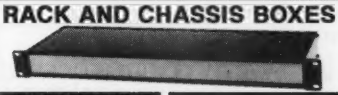
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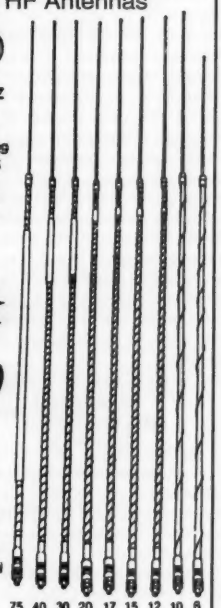

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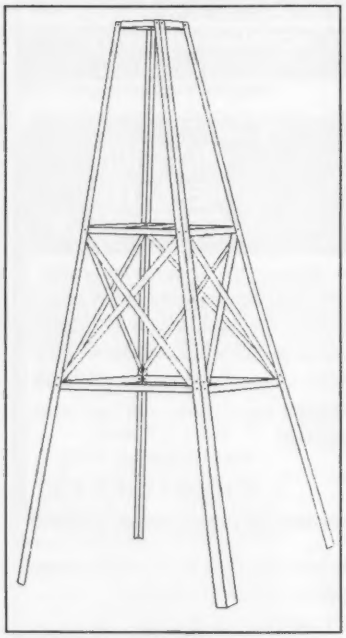


Glen Martin Engineering has announced the addition of two new roof towers to its aluminum antenna support line. The premier model is the RT-936, a 9-foot four-leg tower capable of mounting up to 28 square feet of wind load. This tower weighs just 78 pounds and the price is $378.75.

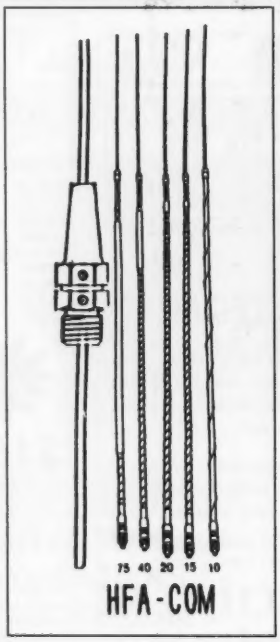
The lighter model is the RT-832, weighing only 37 pounds. This four-leg tower stands 8 feet tall, and will support wind loads of up to eight square feet. This tower is priced at $189.95.

Both towers are UPS shipable. Both come complete with rotator mounting supports and a top plate stamped for direct thrust bearing bolt-up. The towers are constructed of rugged 6061-T6 angle aluminum with stainless steel hardware.

For more information, contact *Glen Martin Engineering, Route 3, Box 322, Boonville MO 65233; (816) 882-2734, FAX (816) 882-7200.* Or circle Reader Service No. 202.

## ANTENNA SALES & ACCESSORIES

ASA has introduced a new HF mobile antenna package for the enthusiast: Model HFA-COM (High Frequency Antenna Combination). This package consists of five separate frequency "fiberwhips": 10, 15, 20, 40, and 75 meters. The unique design of these fiberwhips eliminates the need for retuning after each breakdown and setup. The antenna is designed to withstand a heavy wind load with solid brass and chrome-plated hardware to handle the elements. The approximate assembled length is eight feet. It is priced at $65, plus $5. S & H. For more information contact *ASA, P.O. Box 3461, Myrtle Beach SC 29578; (800) 722-2681.* Or circle Reader Service No. 206.




## AMATEUR NETWORKING SUPPLY

Amateur Networking Supply has introduced two new products designed especially for packet network builders: the Netrix Diode Matrix Board and the WireModem Adapter.

The Netrix is used to create a network switching node of up to six TNCs. The unique stacking configuration eliminates the need for cables, offers significant performance advantages such as higher speed and reliability, costs less than similar products, and is compatible with all TNCs.

The WireModem Adapter is an inexpensive yet reliable plug-in circuit that connects up to six TNCs together via their modem disconnect headers, using a passive WireLan matrix. Applications include connecting multiple network switching modes together, hardwiring a data server into the network, or creating a gateway between different network types. The WireModem can operate at 19,200 baud or more.

Both products are compatible with ROSE and TheNET networks. For prices and more information contact *Amateur Networking Supply, P.O. Box 219, Montvale NJ 07645; (201) 573-2717.* Or circle Reader Service No. 205.

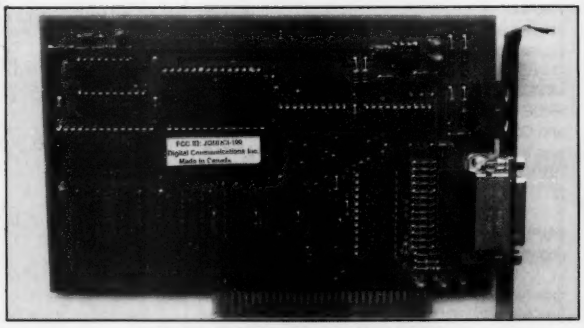
## TEN-TEC

TEN-TEC has introduced a miniature HF transceiver priced at $495. Simply plug in the desired band module and run SSB or CW on any ham band from 160 through 10 meters. Measuring only 2.5" x 7.25" x 9.75" and weighing five pounds, it is about half the size of many small HF transceivers. This 50 watt travel companion truly fits in a briefcase with room to spare. A patented Jones filter provides variable bandwidth 9-pole crystal filtering from 500 Hz to 2.5 kHz. A built-in microprocessor keeps the VFO virtually drift-free and handles the built-in iambic keyer. For more information contact *TEN-TEC, Inc., P.O. Box 8010, Sevierville TN 37864; (615) 453-7172, FAX (615) 428-4483.* Or circle Reader Service No. 203.

## ADVANCED ELECTRONIC APPLICATIONS

For antenna enthusiasts everywhere, the new AEA SWR-121 handheld antenna analyst provides comprehensive antenna performance information in an easy-to-read graphic format. With its LCD spectrum display, the SWR-121 shows an antenna's SWR curve over an entire frequency range, unlike other instruments which can look at only one frequency at a time. This battery-operated unit is designed for portability and easy use.

For more information, contact *Advanced Electronic Applications, Inc., P.O. Box C2160, 2006 196th St. SW, Lynnwood WA 98036; Sales: (206) 774-5554, literature request line: (800) 432-8873.* Or circle Reader Service No. 201.



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*Continued on page 92*


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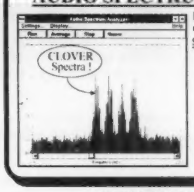


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## REFERENCE

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20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* Covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* A guide to electronic test equipment for the engineer, technician, student and home enthusiast. **$18.00**

20N105 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair* A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly and from the beginning. **$18.00**

01C80 **Master Handbook of 1001 Practical Electronic Circuits** Tried and proven solid state circuits. **$19.95**

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01T01 **Transmitter Hunting** *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

03R02 **Rtty Today** *by Dave Ingram* Modern guide to amateur radioteletype. **$8.50**

05E03 **First Book of Modern Electronics** Unique projects that are money saving. **$12.95**

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09P33 **Pirate Radio Directory** *by George Zeller* Where to tune in on secret entertainment stations. **$7.95**

10F093 **1993 International Callbook** The new 1993 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

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02B10 **Heath Nostalgia** *by Terry Perdue K8TP* 124 page illustrated history of the Heath Company. Includes many fond memories contributed by long-time Heathkit employees. **$9.50**

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12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$10.95**

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20N097 **Radio Operator's World Atlas** *by Walt Stinson, WOCP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

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09S42 The Scanner Listener's Handbook by Edward Soomre N2BFF Get the most out of your scanner radio. $14.95

11T88 Tune in on Telephone Calls by Tom Kneitel K2AES Formatted as a frequency list with detailed description of each service and its location in RF spectrum. $12.95

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11RF13 The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.) by Tom Kneitel K2AES This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. $19.95

11F52 Ferrell's Confidential Frequency List, New Revised Edition
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11SR97 National Directory of Survival Radio Frequencies by Tom Kneitel K2AES Handy and concise reference guide to high interest communications frequencies required by survivalists. $8.95

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AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$15.00**

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AR3193 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WB8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

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# RANDOM OUTPUT

*David Cassidy N1GPH*

## Not That Anybody Asked Me, But . . .

. . . We had a *great* time at the Dallas hamfest this past June. I'll take Dallas over Dayton any day.

. . . Now that the Novice license testing falls under the VE program, how long do you think it will take for the Novice license to go the way of the dinosaur? Also, how many hundreds of youngsters living in non-urban areas will say "ah, screw it" when they find out they have to convince Mom or Dad to drive them a hundred miles or more for a license test?

. . . Why do volunteer examiners get to charge a fee? I thought this was a hobby. Let's see, if you have 25 people show up for an exam session, and they each give you five bucks, you'd walk home with a little over $40 in your pocket (assuming that you split the total among the three VEs). Not bad for an hour's work.

. . . I hear that the new software being installed at the FCC licensing facility in Gettysburg has provisions for assigning special callsigns for a fee. I hope Congress lets the FCC keep the money they collect for issuing custom callsigns.

. . . Our sister publication, *Radio Fun*, achieved something unheard of in the publishing world. A "renewal percentage" is the number of renewals a magazine gets every month, compared to the number of people whose subscriptions expire in that month. Anything over 70% is considered excellent (*73* consistently has a renewal percentage of around 80%). In February, *Radio Fun* had approximately 3500 expirations, and *only 3* subscribers didn't renew. That's close enough to call it a renewal percentage of 100%. It's gratifying to know how much the readers of *Radio Fun* love their magazine.

. . . We had a nice 6 meter opening on the East Coast last week. From my shack in New Hampshire (using an antenna cut for 10 meters), I heard stations in Virginia and South Carolina. I was on the phone with Gordon West yesterday (he lives on the West Coast) and while we were chatting his 2 meter radio started receiving the beacon from Hawaii. Ah, doncha' just love summer band conditions!

. . . Why is it *so* difficult to get people to have a real conversation on the ham bands? We have got to stop this "three-minute monologue then give your callsign" type of QSO. You don't do that with your buddies on the local repeater, so why do we all turn into Edward R. Murrow when we get on HF?

. . . I've got my 20 meter portable QRP station all set for my summer camping trips.

. . . Could you guys on 20 meter CW slow down a little? I haven't worked a whole lot of CW lately, and I'm a little rusty.

. . . Does anyone out there know how to keep deer from eating your tomatoes? Last year, I started about 30 tomato plants from seed, in my kitchen window, in the middle of February. I babied those little plants and had enough plum tomatoes ripening by August to last us all winter (if you've never made tomato sauce with fresh garden tomatoes, you don't know what you're missing). I didn't think the deer would eat tomatoes. Boy, was I wrong! I went away to the National Convention last year, and when I got back, there wasn't a single tomato left.

I've got three dozen tomato plants of several different varieties growing in my garden this year, and short of building a fence, I can't think of anything that will keep the venison from dining on the fruits of my labor. Send your gardening tips to me, c/o *73*.

. . . Could you guys on 20 meter CW please slow down just a little bit more? I'm rustier than I thought.

. . . Would anyone out their like to trade some ham gear for an ultralight vehicle or small plane? Send your inquiries to "The Poor Pilot", c/o *73*.

. . . Speaking of aviation, if you're into flying and are at all interested in the areas of experimental, homebuilts, kitplanes or ultralights, you really ought to be reading *Kitplanes* magazine. The publication is extremely well done, and the head honcho is a ham!

. . . Why do some of you insist on sending mail to my home address? If you want to respond to me in my capacity of Associate Publisher of this magazine, please write to me at the magazine. It really irks me when I get business mail at home (and I *never* answer it).

. . . President Clinton still hasn't found anyone to head up the FCC. The woman he was rumored to have chosen has withdrawn herself from consideration, so as of this writing its anybody's guess.

. . . As I'm writing this, President Clinton is having a chat with shuttle astronauts. He just mentioned the SAREX program! Hey, maybe we should get Chelsea's school signed up for the next SAREX mission. Just think of the positive publicity for amateur radio.

. . . I'd like to get into ATV.

. . . Speaking of ATV, I hear that there is a move afoot to change the rules so ATVers could broadcast music as part of an ATV transmission. I'm not so sure this is a good idea. What do you think?

. . . Ummm, you guys on 20 meter CW —just a *little* slower and I think I'll be all set.

. . . Have you checked out America On-Line yet? If you're using Prodigy, you'll be amazed at how fast a *real* online service can be. AOL doesn't mind "for sale" messages, doesn't censor like Prodigy does, doesn't force you to read ads, doesn't charge extra for downloading software, allows you access to Internet e-mail, and it has *live* conference areas, so you can communicate in real time with a whole bunch of people about any topic under the sun. There's a great ham radio area, too. My AOL address is "D Cass." If you check it out, send me a note.

. . . Watch for Wayne Green's re-entry into the computer publishing field—coming to a newsstand near you this summer.

. . . Wayne's other new magazine, *The Secret Guide To Music*, is growing like gangbusters! If you're a corporate music slave, you probably wouldn't be interested, but if you are the adventurous type and would like to find out about thousands of independent recordings, you really should check it out. They can be reached at the same address as *73*.

. . . I love to run into *73* and *Radio Fun* readers on the air. Look for me on Saturday and Sunday mornings on the 40 and 17 meter bands (10 meters, too, when it's open). You can always send a message via packet to N1GPH@WA1WOK.NH.

. . . OK—you guys on 20 meter CW —just a little slower—please.

Number 29 on your Feedback card

# PROPAGATION

*Jim Gray W1XU*

*Jim Gray W1XU*
*210 Chateau Circle*
*Payson AZ 85541*

Just when you thought the lousy July conditions were going to end, you find out the first days of August are probably going to be worse! However, from about the 5th through the 18th, it looks like conditions will be Fair or Fair to Good, with the better days from about the 14th to the 18th. Unfortunately, the days between the 19th and 24th are expected to be Poor or Very Poor, but improving slowly, so that the days between about the 25th and the 31st will be vastly improved, compared to the previous week.

I expect the ionosphere to be greatly disturbed and the earth's magnetic field to be at the major storm level sometime between the 20th and 23rd.

In general, August is a "blah" month for HF propagation, but normally conditions improve as September and the fall equinox approach. Bear in mind that we are now dealing with low to moderate solar activity as Cycle 22 rapidly nears its 11-year minimum.

### 10-12 Meters

There will be reasonable openings on north-south paths occasionally during the afternoon hours. Sometimes there will be F2 openings to Pacific spots and rare ones to Europe early in the day during the days marked Good on your chart. Short skip 1,300-2,300 miles.

### 15-17 Meters

Regular DX openings are expected on days marked Good and are expected in the Southern Hemisphere during daytime hours, especially in the afternoon. Expect occasional openings on east-west paths to Europe or Africa on days marked Fair to Good, with rare excellent conditions to all parts of the world on a few days. Short skip 1,000-2,000 miles.

### 20 Meters

This is probably your best bet for worldwide DX on Good days, with the band opening from sunrise to a bit after sunset locally. Early mornings and late afternoons provide peak conditions. Short skip will range from about 750 miles to 2,000 miles frequently.

### 30-40 Meters

On Good days, expect openings from after dark to local sunrise to most parts of the world. Expect daylight short skip from 100 miles to 1,000 miles and beyond 1,000 miles after dark.

### 80-160 Meters

Openings will occur on some days during darkness hours and again around sunrise on Good days. Expect frequent transequatorial skip 100-1,000 miles during the day (if we're lucky) and beyond 1,000 miles after dark. Noise is abating from summertime levels. On 160 meters, conditions peak after midnight and again just before dawn. This is the best "night-owl" band for those who are able to take advantage of it. No openings are expected during the day, however, but during darkness hours, you'll work short skip out to 1,000 miles and more.

**EASTERN UNITED STATES TO:**

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 15 | 20 | – | – | – | – | 20 | 20 | – | – | – | 15 |
| AGENTINA | 20 | 40 | 40 | 40 | – | – | 20 | 15 | 15 | 10 | 10 | 15 |
| AUSTRALIA | 15 | 20 | 20 | – | 40 | 40 | 40 | – | – | 20 | 20 | 15 |
| CANAL ZONE | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 15 | 10 | 10 | 15 | 15 |
| ENGLAND | 40 | 40 | 40* | 40* | – | 20 | 15 | 10 | 15 | 20 | 20 | – |
| HAWAII | 15 | 20 | – | – | – | – | 20 | 20 | 20 | 10 | 10 | 15 |
| INDIA | – | – | – | – | – | – | 20 | 20 | – | – | – | – |
| JAPAN | 15 | 20 | – | – | – | – | 20 | 20 | – | – | – | 15 |
| MEXICO | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 15 | 10 | 10 | 15 | 15 |
| PHILIPPINES | – | – | – | – | – | – | 20 | 20 | – | – | – | – |
| PUERTO RICO | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 15 | 10 | 10 | 15 | 15 |
| SOUTH AFRICA | 20 | 40* | – | – | – | – | 20 | 10 | 10 | 10 | 15 | 20 |
| U.S.S.R. | – | – | – | – | – | – | 20 | 15 | 20 | 20 | – | – |
| WESTCOAST | 15/20 | 20/40 | 80 | 160 | 160 | 160 | – | – | – | 10 | 10 | 15 |

**CENTRAL UNITED STATES TO:**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 15 | – | – | – | – | – | 20 | – | – | – | – | 15 |
| ARGENTINA | 20 | 20 | 20 | 40 | 40 | – | 20 | 20 | 15 | 10 | 15 | 15 |
| AUSTRALIA | 15 | 20 | 20 | – | – | – | 40 | – | – | – | 15 | 10 |
| CANAL ZONE | 15 | 20 | 40 | 40* | 40* | – | 20 | 15 | 10 | 10 | 10 | 15 |
| ENGLAND | 40 | 40 | 80 | – | – | – | – | 20 | 15 | 15 | 20 | 40 |
| HAWAII | 15 | 20 | – | 40 | 40 | 40* | 40* | 20 | 20 | 15 | 10 | 15 |
| INDIA | – | – | – | – | – | – | – | 20 | – | – | – | – |
| JAPAN | 15 | – | – | – | – | – | – | 20 | – | – | – | 15 |
| MEXICO | 15 | 20 | 40 | 40* | 40* | – | 20 | 15 | 10 | 10 | 10 | 15 |
| PHILIPPINES | 15 | 20 | – | – | – | – | – | 20 | – | – | – | 15 |
| PUERTO RICO | 15 | 20 | 40 | 40* | 40* | – | 20 | 15 | 10 | 10 | 10 | 15 |
| SOUTH AFRICA | 20 | 40 | – | – | – | – | – | 15 | 10 | 10 | 15 | 20 |
| U.S.S.R. | – | – | – | – | – | – | – | 20 | 15 | 20 | – | – |

**WESTERN UNITED STATES TO:**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 10 | 15 | 20 | – | – | – | – | 40 | 40 | 40 | – | – | 20 |
| ARGENTINA | 15 | 20 | – | 40 | 40 | – | – | 20 | – | 10 | 10 | 15 |
| AUSTRALIA | 10 | 15 | 20 | 20 | – | – | – | 40* | 40* | 20 | 20 | 15 | 15 |
| CANAL ZONE | 15 | 20 | 20 | – | – | – | – | – | 20 | 15 | 15 | 10 | 10 |
| ENGLAND | 20 | 40 | 40 | – | – | – | – | – | – | 15 | 15 | 20 | 20 |
| HAWAII | 10 | 15 | 20 | 40 | 40 | 40 | – | 20 | 20 | 15 | 15 | 10 | |
| INDIA | – | 15 | 20 | – | – | – | – | – | – | 20 | – | – | – |
| JAPAN | 10 | 15 | 20 | – | – | – | – | 40 | 40 | 40 | – | – | 20 |
| MEXICO | 15 | 20 | 20 | – | – | – | – | – | 20 | 15 | 10 | 10 | 10 |
| PHILIPPINES | 10 | 15/20 | 15/20 | – | – | – | 40 | 40 | 40 | – | 20 | – | 20 |
| PUERTO RICO | 15 | 20 | 20 | – | – | – | – | 40 | 40 | 40 | – | – | 20 |
| SOUTH AFRICA | 20 | 20 | – | – | – | – | – | – | – | 15 | 10 | 15 | 15 |
| U.S.S.R. | – | – | – | – | – | – | – | – | – | 20 | 20 | – | – |
| EAST COAST | 15/20 | 20/40 | 80 | 160 | 160 | 160 | – | – | – | – | 10 | 10 | 15 |

*Sp Meters possible on good days only

## AUGUST 1993

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| 1 VP-P | 2 P | 3 P-F | 4 F | 5 F | 6 F | 7 F-G |
| 8 G | 9 G-F | 10 F | 11 F | 12 F-G | 13 F-G | 14 G |
| 15 G | 16 G | 17 G | 18 G-F | 19 F-P | 20 P-VP | 21 VP |
| 22 VP | 23 VP-P | 24 P-F | 25 F-G | 26 G | 27 G | 28 G-F |
| 29 F | 30 F-G | 31 G-F | | | | |

"The FT-416 comes in black – or gray!"

"New sculpted design, built-in VOX, back-lit DTMF pad, Yaesu's "Straight A's"! Wow!"

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  w/FNB-27 5.0, 3.0, 1.5, 0.5W
- CTCSS Encode/Decode
- ATS, Automatic Tone Search
- ATT, Advanced Track Tuning
- ABS, Automatic Battery Saver
- APO, Automatic Power Off
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